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Bob Taft, Governor
Bruce Johnson, Lieutenant Governor
Joseph P. Koncelik, Director

September 20, 2005

RE: TRW MINERVA
MINERVA, STARK COUNTY
FINAL THIRD FIVE-YEAR REVIEW

Ms. Gladys Beard, RPM
U.S. Environmental Protection Agency
Region 5
Mail Code SR-6J
77 W. Jackson Blvd.
Chicago, IL 60604

Dear Ms. Beard:

Enclosed is the final copy (text only) of the Third Five-Year Review for the TRW Minerva facility, Stark County, Ohio. This review was conducted by the Ohio Environmental Protection Agency (Ohio EPA) at the request of the U.S. Environmental Protection Agency (U.S. EPA). This final report was revised to incorporate U.S. EPA comments generated from the draft report. Included in the final report is the sign-off sheet with required signatures by Ohio EPA and the U.S. EPA. After U.S. EPA has signed, please forward a copy to Ohio EPA.

The earlier draft version included sections for Figures, Tables, and Appendices. Please add these to the final text, as they have not changed. Also, enclosed is the residential well survey map (add to Appendix B), and the monitoring and recovery map (add to Appendix F), which was not included in the draft copy of the report. Please note that Table 14, a summary of "Recommendations and Follow-Up Actions," has been added to the text of the report, as requested by the U.S. EPA.

If you have any questions, please call me at (330) 963-1207.

Sincerely,

Vicki Deppisch

Vicki Deppisch
Hydrogeologist/Project Coordinator
Division of Emergency and Remedial Response

VD/kss

Enclosure

ec: Mike Eberle, Ohio EPA, DERR, NEDO

Five-Year Review Report

Third Five-Year Review Report
for
TRW Minerva
City of Minerva
Stark County, OH

September 2005

PREPARED BY:

Ohio Environmental Protection Agency
Northeast District Office
2110 East Aurora Road
Twinsburg, OH 44087

for:

United States Environmental Protection Agency
Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

Approved by:

9/19/05

Rodney Beals, Manager DATE
Ohio EPA
Northeast District Office
Div. of Emergency and Remedial Response

9/29/05

Richard C. Karl DATE
Superfund Div. Director
U.S. EPA, Region 5

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List of Acronyms

1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
1,1,1-TCA	1,1,1-Trichloroethane
ACL	Alternate Concentration Limit
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	Below Ground Surface
CA	Chloroethane
CDM	Camp Dresser & McKee
CERCLA	Comprehensive Environmental Response Compensation & Liability Act
cis-1,2-DCE	cis-1,2-Dichloroethene
DDAGW	Division of Drinking and Groundwaters
DERR	Division of Emergency and Remedial Response
DSW	Division of Surface Water
EAB	Enhanced Anaerobic Biodegradation
GET	Groundwater Extraction Treatment
gpm	Gallons Per Minute
HRC	Hydrogen Release Compound
ICs	Institutional Controls
K	Hydraulic Conductivity
MDL	Method Detection Limit
NCP	National Contingency Plan

LIST OF ACRONYMS - TRW MINERVA

NEDO	Northeast District Office
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
O&M	Operation & Maintenance
OAC	Ohio Administrative Code
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
ppb	Parts Per Billion
ppm	Parts Per Million
PTI	Permit to Install
RCRA	Resource Conservation and Recovery Act
RP	Responsible Party
RW	Recovery Wells
SARA	Superfund Amendments & Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
SCHD	Stark County Health Department
T	Transmissivity
TCE	Trichloroethene
trans-1,2-DCE	Trans-1,2-Dichloroethene

TSCA	Toxic Substances Control Act
U.S. EPA	United States Environmental Protection Agency
ug/l	Micrograms Per Liter
VC	Vinyl Chloride
VOCs	Volatile Organic Compounds

Executive Summary

The remedies for the TRW Minerva site in Minerva, Ohio included an on-site monitored PCB Secure Cell landfill and a ground water extraction treatment system (pump and treat) for the chlorinated solvents in the ground water. These remedial actions were conducted under two State of Ohio Consent Orders in 1985 and 1986. This is the Third Five-Year Review. The trigger date for this review was the Second Five-Year Review date of September 21, 2000.

The assessment of this Third Five-Year Review identified the Secure Cell with non-compliance issues regarding TSCA permit regulations; however, monitoring did not indicate an impact to the environment. The remedy for the PCB contamination is considered protective in the short-term; however, in order for this part of the remedy to be protective in the long term, follow-up actions need to be taken.

A protectiveness determination of the ground water extraction treatment system remedy cannot be made at this time, until further information is obtained. The ground water extraction treatment system has not reached some of the predicted contaminant levels. Two new on-site source areas have recently been identified by TRW. Further information will be obtained by defining rate and extent of the new source areas; remediating these sources; evaluating the ground water extraction treatment system as a remedy; evaluating the monitoring system; evaluating ACL locations and limits; conducting a human health and ecological risk assessment, based on current methodologies; sampling for 1,4-Dioxane; evaluating for vapor intrusion; and addressing all issues regarding residential wells.

The remedy is not protective for residential wells unless follow-up actions are taken to ensure protectiveness. Routine sampling should be conducted on the residential wells or the wells should be abandoned. Interim institutional controls need to be identified and implemented to reduce exposure. Although the compliance point wells monitor the level of contaminants on a continuing basis and the remedy as containment appears to be working, the Village of Minerva is only required to conduct VOC sampling of the municipal water supply wells once every three years. To ensure protectiveness VOCs should be sampled more frequently on a continuing basis. This frequency is not sufficient to determine a level of protectiveness.

Long term protectiveness cannot be evaluated until the above items have been addressed. As a protectiveness determination of the remedy cannot be made until the recommended actions discussed above are taken, the protectiveness of the remedy will need to be reconsidered within a year of the date of this Five-Year Review. At that time, progress toward completing the recommended actions will be evaluated. This will be made through a Five-Year Review Addendum.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name *(from WasteLAN)*: TRW, Inc. (Minerva Plant)

EPA ID *(from WasteLAN)*: OHD004179339

Region: 5	**State: OH**	**City/County: Minerva/Stark**

SITE STATUS

NPL Status: ☒ Final ☐ Deleted ☐ Other (specify) _____

Remediation Status (choose all that apply): ☐ Under Construction ☒ Operating ☒ Complete

Multiple OUs?* ☒ YES ☐ NO	**Construction Completion Date:** 1985 & 1986

Has site been put into reuse? ☒ YES ☐ NO

REVIEW STATUS

Lead Agency: ☐ EPA ☒ State ☐ Tribe ☐ Other Federal Agency _____

Author Name: Vicki Deppisch

Author Title: Project Coordinator	**Author Affiliation:** Ohio EPA

Review Period:** 09/14/2000 to 09/21/2005

Date(s) of Site Inspection: 10/07/2004 to 10/13/2004

Type of Review:

☐ Post-SARA
☐ Non-NPL Remedial Action Site
☐ Regional Discretion
☒ Pre-SARA
☒ NPL State/~~Tribe~~-lead
☐ NPL-Removal Only

Review Number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify) _____

Triggering Action:

☐ Actual RA Onsite Construction at OU #____
☐ Construction Completion
☐ Other (specify) _____
☐ Actual RA Start at OU #____
☒ Previous Five-Year Review Report

Triggering Action Date *(from WasteLAN)*: 09/21/2000

Due Date *(five years after triggering action date)*: 09/21/2005

Third Five-Year Review Summary Form - contd.

ISSUES

Secure Cell (PCBs): Flooding or possible cap failure may have affected the Secure Cell.

Ground Water Extraction Treatment System: Two new source areas have been identified. Rate and extent of contamination has not been defined.

Institutional Controls: Institutional Controls have not been implemented at the Site.

RECOMMENDATIONS AND FOLLOW UP ACTIONS

Institutional Controls

The original remedies did not include institutional controls for the TRW facility or impacted areas. Within six months of the date of this Five-Year Review, an interim institutional control plan should be developed for the Site to reduce exposure to contaminants while further investigation is undertaken. This interim institutional control plan should be implemented within one year of this Five-Year Review.

Secure Cell (PCBs)

The increase of leachate quantity during 2003 and 2004 is suspect. The integrity of the cap should be investigated by TRW. Cap/cell failure may affect current and future protectiveness.

Ground water elevations should be measured for monitoring wells 13 and 20. Ground water flow maps should be included in each report. Monitoring wells MW-13, MW-19A, and MW-20 should be sampled for PCBs. The analytical method, Method Detection Limit (MDL), and background levels should be included in each report. A map identifying the locations of the Secure Cell, main buildings (PCC Airfoils), leachate tank, lysimeters, identified monitoring wells, etc., should be included in each report. The lysimeters should be evaluated for future use. These recommendations should not affect the current or future protectiveness.

Methylene chloride was detected in various samples in many of the reports and is a common laboratory contaminant. Dibromochloromethane and some other compounds were also detected at low levels. The reports should evaluate the detection of these constituent and, if data suggests, indicate a possible source (i.e., laboratory contaminant). This should not affect the current or future protectiveness.

Non-compliance issues with the TSCA permit and Consent Order should be addressed and

resolved. The permit and Consent Order should be re-evaluated.

Ground Water Extraction Treatment System

New Source Areas

The rate and extent of the new source areas should be identified and investigated. Potential affects on the residential wells, municipal water wells, vapor intrusion, ground water model, recovery wells, monitoring wells, ACLs, etc., should also be evaluated.

Residential Wells

Residential wells, identified by TRW in the potentially impacted area, appear to fall into three categories: (1) the well exists, but not used for any purpose, (2) well used for other purposes except drinking, and (3) well used for potable water supply. Some residents in the potentially impacted area did not respond to the survey. The wells that are not used should be correctly abandoned. Wells used for other purposes and wells used for potable water should be tested on a routine basis and have back flow preventers installed. Back flow preventers are designed to prevent cross contamination. The Stark County Health Dept., TRW Project Manager, and Ohio EPA are currently discussing these issues, which are still unresolved. The Stark County Health Dept. has jurisdiction over residential wells.

According to the Stark County Health Dept., no new residential wells can be installed, if an existing municipal waterline and hookup exists next to the property. Conversely, residential wells can be installed where no municipal waterline or hookup exists. Stark County Health Dept., TRW Minerva Project Manager, and Ohio EPA are evaluating this area and comparing it to the potentially impacted area.

VOC testing on residential wells is not conducted on a routine basis; the last testing was conducted in 1996. As specified in this report, under "Second Five-Year Review (2000) Summary," there were several detected VOCs. One well was above the MCL for vinyl chloride; however, the well was used at that time for secondary purposes.

Interim institutional controls need to be identified and implemented to reduce possible exposure to contaminants in well water. This may include enactment of local ordinances regarding well use, well closure, and a communication plan for residential well users.

The two new identified source areas that are currently under investigation for defining the extent of contamination and the requested sampling for 1,4-Dioxane may also affect the protectiveness of the residential wells. The residential well issues affect the current and future protectiveness.

Village of Minerva's Municipal Wells

The Village is only required to sample VOCs once every three years. Water quality in the village's municipal wells should be monitored on a routine basis by TRW. The raw water

before treatment should be sampled. TRW should conduct this sampling.

Vapor Intrusion

Property assessment of potential impacts to indoor air from soil and/or ground water contaminated with VOCs has become a significant issue in the evaluation of environmental and health impacts at sites based on an evolving understanding of soil vapor migration and intrusion. As a result, TRW Minerva should be evaluated to determine if this site has the potential for exposures related to soil vapor intrusion. The Site should be evaluated to determine whether the vapor intrusion pathway is complete. If it is determined to have a complete pathway, further evaluation is necessary to determine whether the pathway poses a potentially significant risk to human health and whether interim or long-term mitigation or remedial measures are necessary. Further consideration of the vapor intrusion pathway must be considered if future plans for the Site include development that could result in a complete exposure pathway.

Ground Water Monitoring Wells/Recovery Wells/Compliance Point Wells

The ground water monitoring and recovery well system should be re-evaluated once the rate and extent of ground water contamination is defined. The ACL compliance point well locations should also be evaluated. At that time, a comprehensive sampling of all monitoring wells should be discussed. Until then, the current monitoring system and recovery wells should be maintained including, but not limited to, locking, bumper guards (if needed), repairing aprons, installing identifying numbers on all wells (including recovery wells), etc. TRW is responsible for conducting this work. The above affects the current and future protectiveness.

Degradation Products

All degradation products (as well as any other VOC detected) should be evaluated and reported. This may affect the current and future protectiveness.

ACLs/Risk Assessment/Toxicity Issues

The ACLs were based on very early risk methodologies, which may affect the current and future protectiveness. An updated human health and ecological risk assessment should be conducted.

Monitoring Well 13 and 13B

This issue is still unresolved. Monitoring well 13 is specified as one of the compliance point wells; however, this well is usually dry. When well 13 is dry, TRW has been substituting monitoring well 13B in it's place for sampling. The ground water monitoring wells 13 and 13B are in close proximity to each other and similar in depth. In order to provide accurate

trend data, the Work Plan in the Subsurface Order should be changed to make well 13B one of the compliance point wells. Well 13 should be used for static water level measurements (when not dry) and, in the event of the GET shutdown, could be used for sampling. This probably does not affect the current or future protectiveness.

Laboratory Dilution Factor

Ohio EPA does not know if this item has been addressed from the 2000 Review. The laboratory should note the dilution factor on the bottom of the analytical data sheets and, in turn, this should be included on all raw data, summary lab sheets, etc., to Ohio EPA and the Minerva repository file. This probably does not affect the current or future protectiveness.

Future Remedy Selection

Once additional investigations and necessary risk assessments have been completed, the remedy selection process should be utilized to determine what additional remedial actions need to be taken, including what final institutional controls are required and the extent of the area subject to institutional controls.

PROTECTIVENESS STATEMENTS

Secure Cell (PCBs)

The U.S. EPA has indicated that there are non-compliance issues (i.e., lysimeters, etc.) with the TSCA permit regulations. The ground water monitoring wells surrounding the Secure Cell have not indicated an impact to the environment. Compliance issues and investigations need to be completed.

The remedy for the PCB contamination on-site is considered protective in the short-term; however, in order for this part of the remedy to be protective in the long term, follow-up actions need to be taken, including implementation of institutional controls.

Ground Water Extraction Treatment System

A protectiveness determination of the remedy at TRW Minerva cannot be made, at this time, until further information is obtained. The goal of the remedy, decreasing contaminants over time to predicted levels, has not been met. Further information will be obtained by defining the rate and extent of the newly identified source areas; remediating these source areas; evaluating the ground water extraction treatment system (and recovery wells) as a remedy; evaluating the ground water monitoring system; evaluating ACL locations; re-calculating ALC numbers using current human health and ecological risk assessment methodologies and guidance; sampling for 1,4-Dioxane and evaluating all degradation products; evaluating for vapor intrusion; and addressing all issues regarding residential

wells.

(A) Residential wells: The remedy is not protective unless follow-up actions are taken to ensure protectiveness. Routine sampling should be conducted on the residential wells or the wells should be abandoned. Interim institutional controls need to be identified and implemented to reduce possible exposure to contaminants in well water. This may include enactment of local ordinances regarding well use and well closure.

(B) Municipal water supply wells: Although the compliance point wells monitor the level of contaminants on a continuing basis and the remedy as containment appears to be working, the Village is only required to conduct VOCs sampling once every three years. Even though no VOCs were detected in the 2001 and 2004 analytical results, the sampling frequency for VOCs is not sufficient to determine a level of protectiveness; therefore, a protectiveness determination cannot be made at this time.

LONG-TERM PROTECTIVENESS

Long term protectiveness cannot be evaluated until all of the above have been addressed.

As a protectiveness determination of the remedy cannot be made until the recommended actions discussed above are taken, the protectiveness of the remedy will need to be reconsidered within a year of the date of this Five-Year Review. At that time, progress toward completing the recommended actions will be evaluated. This will be made through a Five-Year Review Addendum.

OTHER COMMENTS

In the event the GET system is turned off, preventive measures should be implemented to protect all receptors that include the Village of Minerva's water supply and residential wells.

TRW Minerva Site
Minerva, Ohio
Third Five-Year Review

I. INTRODUCTION

Purpose

The purpose of the Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of review are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Ohio Environmental Protection Agency (Ohio EPA) is preparing this Five-Year Review report pursuant to the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section (104) or (106), the President shall take or require such action. The President shall report to the congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

Ohio EPA interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Ohio EPA's Division of Emergency and Remedial Response (DERR), conducted the Five-Year Review of the remedies implemented at the TRW Minerva Site (Site) in Minerva, Ohio. This review was conducted by Ohio EPA's Project Coordinator for the entire Site from October 2000 through September 2005. This report documents the results of the review.

This is the third Five-Year Review of the Site. The first Five-Year Review report was completed in June 1995 and accepted by the United States Environmental Protection Agency (U.S. EPA) in July 1995. The second Five-Year Review report was completed in July 2000 and accepted by the U.S. EPA in September 2000. The remediation activities have been conducted under two separate Ohio EPA Administrative Orders on Consent (Consent Order), the first was dated June 5, 1985 and provided for surface soil and sediment cleanup (Secure Cell), and the second was dated May 9, 1986 and provided for ground water investigation and remediation. The U.S. EPA was not a signatory to either one of these Administrative Orders.

History of Consent Orders

Remedial investigations at TRW Minerva began in 1981 following the discovery of polychlorinated biphenyls (PCBs) in soil and sediments. Investigations revealed the presence of volatile organic compounds (VOCs) in ground water below the Site. Residual concentrations of VOCs were subsequently detected in site soils and sediments as well. In order to proceed with the remediation as quickly as possible, TRW and Ohio EPA chose to separate the resolution of the surface soil and sediment issues (a source remediation problem, concerned with PCBs) from the ground water issues (a chemical migration problem, concerned with VOCs). This approach allowed the remediation of the surface soil and sediment to proceed, while continuing with the ground water investigation.

The surface soil and sediment cleanup was carried out in accordance with the June 5, 1985 Administrative Order on Consent after the U.S. EPA issued an approval with conditions for a Toxic Substances Control Act (TSCA) 40 CFR Section 761.75 authorization, dated May 31, 1985, and amended August 2, 1985, to conduct a remedial action on the Site and allowing for the disposal of remedial wastes into a solid waste secure landfill constructed on-site. The U.S. EPA approval conditions for the secure landfill attached to Ohio EPA's Consent Order requires a minimum of 30 years of sampling and testing of ground water, surface water, and leachate. In addition, Ohio EPA's Consent Order requires semiannual monitoring of selected ground water wells and sediment after site closure.

The May 9, 1986 Administrative Order on Consent for ground water investigation and remediation included, as a major component of the remedial action, the installation of a ground water extraction system. In accordance with paragraphs 5 and 6 of Section V, Work to be Performed, of the Consent Order, TRW was required to examine the effectiveness of the ground water treatment system by comparing the predicted cleanup concentrations with actual analytical results from ground water monitoring compliance wells, and then to report their findings to Ohio EPA. Reports prepared in connection with the Consent Order,

numerous analytical data from the ground water compliance wells, and

historical documents were used in the preparation of this review and recommendations. The Site was listed on the National Priorities List (NPL) by the U.S. EPA in 1987.

Ohio EPA has conducted the first, second, and third Five-Year Reviews at the Site at the request of the U.S. EPA. According to U.S. EPA's guidance (OSWER Directive 9355.7-03B-P, Draft, October 1999, for the first and second Five-Year Review and OSWER Directive 9355.7-03B-P, June 2001, for the third Five-Year Review), Five-Year Reviews are conducted under two circumstances. First, under CERCLA section 121©) and section 300.430(f)(4)(ii) of the NCP, comprehensive, statutory reviews are conducted of sites at which hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure following completion of all remedial actions; and second, policy reviews are conducted of remedies selected prior to the enactment of the Superfund Amendments and Reauthorization Act of 1986 (SARA) or of post-SARA remedies where, upon completion, no hazardous substances will remain, but it will take five or more years to reach that point. The remedy at the Site predates SARA, which occurred in October 1986. Therefore, the Fire-Year Review being conducted by Ohio EPA, on behalf of U.S. EPA, is being done as a matter of U.S. EPA policy.

II. TRW MINERVA CHRONOLOGY

Table 1 - Chronology of Site Events

Event	Surface Date	Grd. Water Date
Investigations detected PCBs in soil and sediment.	1981	
VOCs detected in the ground water and soils.		1984
Site Inspection	June 20, 1983	August 27, 1984
RI	1983/84	April 17, 1985
FS	August 27, 1984	Nov. 26, 1986
Public Meeting	No Public Meeting	Feb. 27, 1986
Close Comment	None	March 7, 1986
Signed Consent Order	June 5, 1985	May 9, 1986

TSCA Authorization	May 31, 1985	N/A
Amend Consent Order	Aug. 2, 1985	N/A
RD Completion	Included in Aug. 27, 1984 and prior	Sept 9, 1986
Listed on National Priorities List (NPL) by U.S. EPA.	1987	1987
RA Construction Completion	May 19, 1986	Feb. 1987
Five-Year Review completed by Ohio EPA for U.S. EPA.	1995	1995
Second Five-Year Review completed by Ohio EPA for U.S. EPA.	2000	2000

III. BACKGROUND

Physical Characteristics

The Site is located at 3860 Union Avenue S. E., in the town of Minerva, Stark County, Ohio. The plant site is adjacent to State Road 183, approximately 1.3 miles northeast of the intersection of Route 183 and U.S. Route 30, as indicated in Figure 1. Farmland is north and east of the Site, while undeveloped woodlands are to the west. Residential homes are located to the south and southwest. The Village of Minerva's municipal well field is located to the southwest and less than a mile from the Site (Figure 2). According to the 1986 Consent Order, the overall Site consists of approximately 135 acres, which includes the plant site of 54 acres and the additional properties known as the "south property" and the "east property," which are adjacent to the 54 acre parcel (Figure 3). Ground water flow is to the south and southwest.

Located on the 54 acre parcel is the single major building, which comprised the Minerva, Ohio, Casting Division facility of the TRW Aircraft Components Group. TRW sold the Minerva facility to PCC Airfoils on June 27, 1986, but has retained responsibility for the surface cleanup/Secure Cell and ground water remediation projects.

In addition to the plant itself, important features located on the TRW property included a drainage swale running along the eastern and southern borders of the plant; an ornamental lake, West Lake; a discharge stream running from West Lake to Sandy Creek; a drainage

lagoon, South Pond; the wax ditch, which runs from the plant to South Pond; and a rubble pile.

Hydrogeologic Setting

The Site is located at the approximate boundary between two physiographic provinces: the unglaciated Allegheny Plateau to the south and the glaciated plateau that extends northward to Lake Erie. The Site overlies a northeast-southwest trending preglacial river valley that is filled in with glacial outwash. These permeable materials are overlain by a 5-20 foot layer of clay-rich glacial till. According to boring logs, the glacial till material is described as "sand, gravel and clay" or "clay and stones." Significant clay lenses were not encountered in the area. Depth to bedrock is approximately 150 feet below surface along the center of the valley where the Central Area and the Southwestern Area are located, although there are no borings to confirm this depth. In the vicinity of the Barn Area (monitoring well W4m), bedrock was encountered at a depth of 53 feet, at monitoring well 32m bedrock was encountered at 18.5 feet, and at 131 feet at monitoring well 29m. Monitoring well 32m is the only well screened to the top of bedrock. The screened interval is between 8.5 feet and 18.5 feet. Initial analytical results detected 1 ppb of trans-1,2-DCE in the ground water at well 32m. Bedrock consists of the Pennsylvanian Lower Allegheny or Upper Pottsville Groups, which are characterized by interlayered units of sandstone, shale, limestone, and coal.

Land and Resource Use

The historic land use indicates the TRW facility was a manufacturing plant that housed a metal casting operation in which volatile organics and PCBs were used. PCC Airfoils purchased the facility in 1986; the facility remains a metal casting operation.

The current land use for the surrounding area is residential and commercial/industrial and has not changed since the last Five-Year Review. The PCB Secure Cell Landfill and the extraction system facility are both fenced and locked.

History of Contamination

In August 1981, TRW notified the U.S. EPA and Ohio EPA of its discovery of PCBs in the soil at the southeast corner of the plant. Plant records suggested that spent oil used in diffusion pumps that contained PCBs had been stored in this area. Further investigation identified five areas of the Site with significant residual concentrations of PCBs in soils and sediments. Significant concentrations were found in some areas of the Site. In the swale, PCB concentrations ranged from < 1 part per million (ppm) to 1600 ppm. PCB concentration ranged from <1 ppm to 2000 ppm in the South Pond. In the wax ditch, PCB concentration ranged from 2000 to 5000 ppm. In the rubble pile, the PCB concentration

ranged from <1 ppm to 1,000 ppm. In surface soils on the Fry property (owned by TRW), the PCB concentration averaged less than 10 ppm, but 2 of 51 samples detected concentrations >10,000 ppm.

Volatile organics were discovered in ground water on and off-site in 1984. Volatile organics were used at the Site during materials processing and handling. Spent degreasing materials were discharged directly to the wax ditch and flowed into the South Pond. Dredged material from these areas were deposited on the rubble pile. The areas of ground water contamination have been identified as the Barn, Eastern, Central, and Southwest Areas and are shown in Figure 4. The major contaminants detected in the water are tetrachloroethene (PCE), trichloroethene (TCE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethene (1,1-DCE), vinyl chloride (VC), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), and chloroethane (CA). Table 2 is a summary of the analytical data for sampling events between June 1984 and April 1986 during the investigation study.

Barn Area. Eight contaminants (1,1,1-TCA, 1,1-DCA, CA, PCE, TCE, 1,1-DCE, trans-1,2-DCE, and VC) were detected in three Barn area wells, W5s, W4m, and 42m. The highest concentration detected was 1,000 ppb of 1,1,1-TCA. Contamination was detected down to bedrock, which at this portion of the Site lies at a depth of only 53 feet. The source is unknown.

Eastern Area. Low levels (less than 4 ppb) of contamination were detected in ground water at this portion of the Site, extending to a depth of 60 feet. 1 ppb of trans-1,2-DCE was detected in well 36m. The same constituent was detected in a residential well at 2 ppb. Vinyl chloride was detected in two other residential wells between 1 and 2 ppb. TRW stated that this contamination probably was not caused by them.

Central Area. This was the most extensive area of contamination and contained the highest concentrations of organic compounds: up to 2,000 ppb of 1,1-DCA in well 13; 1,700 ppb of CA in well 18; and 1,500 ppb of 1,1-DCA, 1,300 ppb of TCE, 1,300 ppb of trans-1,2-DCE, and 190 ppb of VC in well 19/19a. The organic compounds were present in the upper forty feet of the aquifer and decreased in concentration with depth. The source or sources are believed to be the former South Pond, wax ditch, and rubble pile.

Southwestern Area. 1,1,1-TCA, trans-1,2-DCE, and VC were detected in the wells. The highest concentration was 32 ppb of VC in well 35m. The contamination was detected as deep as 90 feet below grade in investigative samples.

A total of 47 monitoring wells were installed on and off-site during the ground water investigation (Figures 2 and 5). According to the ground water flow maps for 1988 through

1992 included in the "Five-Year Report for the Groundwater Extraction and Treatment System for the TRW Site, Minerva, Ohio," dated June 12, 1992, by Clement Associates, Inc., ground water flow is to the south and southwest (Figures 6-10).

Residential Wells

At the time of the initial investigation, many homes south of the Site individually had a residential well for their water supply source. To the southwest and north of Sandy Creek is a residential area known as the Old Park area. The area south of Sandy Creek, bordered to the south and east by the Pennsylvania Railroad, is known as the Fry allotments. A total of 50 residential wells were sampled and analyzed. PCBs were analyzed in twelve of the samples. No PCBs were detected in these 12 wells and further PCB testing was not pursued. The main contaminant detected in residential wells was VC, with a range of 1 to 57 parts per billion (ppb). Other constituents found in the residential wells were DCA, TCA, TCE, and trans-1,2-DCE. Most of the homes with contaminated wells have been connected to the city water system. However, the contaminated wells are reportedly still used for "outdoor activities" (car washing, garden watering, swimming pools, etc.) and have not been abandoned. The sample locations and analytical data from the initial investigation are presented in Figure 11 and Table 3. A map, dated May 6, 1994 (Figure 12), from Dennis Clapper, Service Director, Village of Minerva, indicated the locations of all residential wells that were currently used for a primary drinking water source and had not been hooked up with the city water supply during the time the 1995 Five-Report Review report was generated. The Stark County Health Dept. has jurisdiction over residential wells. Table 4, from the 1995 report, provided the current owner for each well. Well logs for most of the area could not be located. However, the logs that were available indicated some wells were in bedrock, as well as sand and gravel.

Village of Minerva's Drinking Water Supply Wells

The Village of Minerva's municipal water supply is less than a mile downgradient of the Site. The city has four wells, three of which are currently in use. Each well pumps 580 gallons per minute (gpm), but the pumping time varies for each well. The boring logs indicate the wells are in sand and gravel and are 75 to 85 feet deep. Volatile organic testing from the Minerva wells and plant tap were conducted quarterly, since 1,1-DCE was detected at levels between 2.0 and 4.0 ppb in July, 1989. No volatile organics were detected in the wells from 1989-1993 from the well or the distribution tap. No volatile organics were detected in the wells during 1994 from the distribution tap. The city went from required quarterly VOC sampling to annual VOC sampling in 1994. Today the Village is required to sample VOCs once every three years.

IV. REMEDIAL ACTIONS

Ground Water Extraction Treatment (GET) System

The conclusions of the site investigations formed the basis of the Consent Order between TRW and Ohio EPA. The Consent Order required TRW to design, construct, maintain, and operate a ground water extraction treatment (GET) system (i.e., pump and treat system) consisting of ground water extraction wells and air stripping of VOCs.

The Consent Order established that the remediation system remain operational until four quarters of monitoring data demonstrate compliance with one (or a combination) of the following performance standards:

1. Ground water quality meets or exceeds established drinking water standards for the parameters of concern; or

2. Ground water quality reaches background or 1 X 10^{-6} cancer risk concentrations for the parameters of concern; or

3. Ground water quality meets or exceeds alternate concentration limits as established under the procedure set forth in 40 CFR Section 264.94 and Ohio Administrative Code (OAC) 3745-54-94, and as further described in Attachment B of the Order.

The GET system was constructed in 1986. It includes eight recovery wells (RW wells) pumping at a combined rate of 1,200 gallons per minute (gpm). The ground water recovered is pumped to an air stripper located on the TRW property. This system has been in operation since February 1987.

O'Brien & Gere conducted a 24-hour pumping test in July 1991, to assess the recovery system after four years of operation. Time-drawdown data and straight-line graphs from this test and from a subsequent test conducted in February 1992, are presented in their 1995 Five-Year Report. Values of transmissivity (T) and hydraulic conductivity (K) were calculated from these tests. These values were then input into a two-dimensional analytical flow model called QUICKFLOW, which was developed by Geraghty and Miller, Inc.

Nine monitoring wells are denoted "compliance wells" and are monitored quarterly, using Method 601, a gas chromatograph method designed to detect volatile organics. Four of the nine wells were selected to characterize levels of organic contamination in the plumes. These monitoring wells are: W4m (Barn Area); 19a and 13 (Central Area); and 35m (Southwestern Area). These wells exhibited the highest concentrations in their respective areas. The other five wells are located at the leading edge of the plumes to determine

whether contamination was being contained within the area of influence of the pumping wells; these include well 24s (south of Central Area plume) and wells 34m, 41m, and 44s and 44d (surrounding the southwestern plume). On-site compliance wells are W4m, 13 or(13b), 19a, and 24s. The off-site compliance wells are 35m, 41m, 44s, and 44d. These wells are located in the residential area south of the Site.

Ground Water Contamination Objectives

The Consent Order specified that an "Alternate Concentration Limit" (ACL) could be developed and used as target cleanup levels. A "risk assessment" was performed to develop ACLs at the compliance points. Based on this assessment, TRW concluded that development of the ACLs could focus on the most significant of the exposure points, the Minerva City wellfield. Transport modeling was used to develop a relationship between the chemicals at the compliance points and the exposure point (Minerva City wellfield). This relationship was then applied to "health protective concentrations" to develop ACLs. The ACLs developed for the compliance point wells located on and off the Site are listed in Table 5. A separate ACL was adopted for the VC concentrations in the off-site wells. The Consent Order also required that chemical concentrations at the compliance points be predicted at 1, 5, and 10 year intervals. The predicted concentrations are shown in Table 6.

Surface Contamination Objectives - PCBs

The remedial objective for the surface contamination involved the excavation of soils and sediments contaminated with the highest concentration of PCBs and their placement in a secure, monitored cell on-site. Areas where lower concentrations of PCBs were detected were capped with clay.

Institutional Controls and Land Ownership

No institutional controls (i.e., ground water or land use restrictions) were implemented through either order. All potable water on the Site is obtained from the municipal wells. TRW owns three parcels of land of the Site: (1) fenced in ground water extraction treatment system, (2) fenced in Secure Cell, and (3) an open field beside and just south of the Secure Cell. PCC Airfoils owns the rest of the Site.

First Five-Year Review (1995) Summary

Analysis of Ground Water Data: Data derived from the four compliance point wells that yielded contaminated ground water samples (monitoring wells W4m, 13/13b, 19a, and 35m) indicated highly variable levels of contamination, with unexpected trends. (These data, as graphed by Clement Associates, Inc., are provided in Figures 13-16). Table 7 compared

1986, 1991, and 1992 ground water data. Table 8 lists data from May 1992 through August 1994 for monitoring wells W4m, 13b, 19a, and 35m. Table 9 compared predicted concentration following five years of remediation to 2-12-92 and 8-3-94 data. The following was summarized:

1. Organic levels in Well W4m (Barn Area) appeared to have varying periods of increases and decreases, since the GET system was installed. The 8-3-94 data indicated another upswing trend. Data comparisons to predicted five-year levels showed wide fluctuations, but overall the predicted concentrations were not met. In some cases the method detection limits (MDLs) were too high to evaluate a lower predicted five-year concentration figure.

2. Levels of 1,1-DCA, 1,2-DCE, and CA in samples from well 13/13b (Central Area) fluctuated considerably from 1984 through 1988, but settled to generally lower levels in 1989. The contaminant levels appeared to continue to surge and ebb with no general increasing or decreasing trend. The data indicated wide fluctuations. Overall, the five-year predicted concentrations were not met.

3. Other than one detection of a high level of TCE (almost 1,400 ppb) in monitoring well 19a (Central Area) in 1987, levels of organics in that well had generally decreased over time. Some constituents had met the predicted five-year concentrations.

4. Levels of VC in samples from well 35m decreased until 1987, then increased, hitting a peak of about 75 ppb in November 1990. Since then, there was an overall decreasing trend. The five-year predicted concentration for VC was met for this well.

Predicted contaminant levels in the highly contaminated wells W4m, 13, 19a, and 35m after five years of extraction had not yet been met in four of the five wells. Monitoring wells 24s, 34m, 41m, 44s, and 44d had met the five year predicted concentration of <1 ppb.

Analysis of Ground Water Treatment Extraction System: The adequacy of the GET system to contain contaminated ground water could not be thoroughly evaluated from the information presented for the 1995 Five-Year Review Report. Generally, O'Brien & Gere and Clement Associates, Inc. had not provided adequate information for the analytical techniques chosen for this work. The assumptions inherent in the chosen techniques were not discussed.

The data provided in the first Five-Year Review and quarterly ground water sampling data

indicated wide swings in contamination levels with varying short-lived trends. The expected steady decrease in aquifer contamination levels was not borne out by these data. The conclusion of the above was that the GET system was working; however, it may not have been working optimally or as predicted.

Analysis of the Secure Cell Data: As stated in the 1995 Five-Year Review Report, PCBs had not been detected in the monitoring wells surrounding the Secure Cell according to analytical data and Personal Communication with Tom Alcamo, U. S. EPA, Region 5, (October, 1994).

TRW has not conducted any additional PCB testing in other monitoring wells, since the initial investigation.

Second Five-Year Review (2000) Summary

TRW submitted a document summarizing site activities (since completion of the 1995 Five-Year Review Report) to Ohio EPA for the second Five-Year Review Report entitled, "Former TRW Inc. Aircraft Components Plant Minerva, Stark County, Ohio, 10-Year Review Report," dated March 2000, and a new ground water model.

Residential Wells: In December 1996, 33 residential wells were sampled by Ohio EPA for volatile organics in the vicinity of the Site. Sampling locations included potable water wells and other locations that were connected to city water, but that might still use the well water for other purposes such as swimming pools, washing the car, watering the garden, etc.

The following was detected:

817 Ike St.	1.5 ug/L	1,1-Dichloroethane (12/17/96)
4054 Whitacre	1.6 ug/L	P-Dichlorobenzene (12/4/96)
	0.9 ug/L	P-Dichlorobenzene (12/17/96)
1004 Stafford	3.3 ug/L	Vinyl Chloride (12/4/96)
	3.9 ug/L	Vinyl Chloride (12/17/96)

The well at 4054 Whitacre is used as the potable water source. The other two wells are not used for the potable water source, only for secondary use. Figure 17 identifies the location of current residential wells, and Table 10 lists the addresses and names for the Second Five-Year Review. Table 10 also includes a list of residential well users that have been using municipal water since May 6, 1994. (The detailed analytical data are included in Appendix B of the Second Five-Year Review, September 2000.)

Village of Minerva Drinking Water Supply Wells: A review of Ohio EPA files for the Village of Minerva community water system indicated no MCL violation, since the 1995 Five-Year

Review was completed. VOC monitoring was conducted in 1996, 1997, and 1998. The Village of Minerva was not scheduled to conduct VOC sampling again until 2001, at which time they were required to sample VOCs once every three years.

Compliance Well Data and Comparison to (1) 1995 Five-Year Review Data (2) Alternate Concentration Limits (ACLs) and (3) Predicted 10-Year Modeling Concentration-Summary: Nine monitoring wells have been designated compliance points. Wells 13 (13B), 19A, W4M, and 24S are on-site compliance points. Wells 34M, 35M, 41M, 44S, and 44D are off-site compliance points.

Table 11 lists the contaminants and concentrations for each well from the second quarter 1995 through the first quarter 2000. Table 6 shows the projected contaminant concentrations after 5 and 10 years, and Table 5 shows the Alternate Concentration Limits for on-site and off-site compliance wells.

Well 4M - The contaminants 1,1,1-TCA, 1,1-DCA, PCE, TCE, and cis-1,2-Dichloroethene (cis-1,2-DCE) were detected in the ground water. The overall contaminant concentration is lower in the current data than in the Five-Year Review Report 1995 data. There are still wide fluctuations of each contaminant from one sampling event to the next.

All contaminants, except PCE and VC, met the on-site compliance ACL concentrations. PCE exhibited wide fluctuations, which averaged above the ACL, and the MDL for VC was too high to know if the ACL was achieved.

All contaminants failed to reach the "Predicted 10-year Concentration" (Table 6) number, either by detecting a higher numerical contaminant concentration or having a Method Detection Limit (MDL) too high to tell if the predicted concentration was achieved.

Well 19A - The contaminants detected were 1,1-DCA, VC, TCE, and cis-1,2-DCE. 1,1-DCA exhibited an overall decrease in the concentration compared to the Five-Year Review Report 1995 data, until the first quarter 2000 when a higher concentration was detected. Except for VC, the other contaminants had an overall decrease in contaminant concentrations with some wide fluctuations in the data. The VC concentration increased.

The contaminants 1,1-DCA, and TCE overall met the "Predicted 10-Year Concentration," with a few high fluctuations. 1,1-DCE met the "Predicted 10-Year Concentration." VC and cis-1,2-DCE (reported as trans-1,2-DCE) did not meet the predicted concentrations.

VC did not meet the ACL.

Well 13 (or 13B) - This well had detections of 1,1-DCA, CA, TCE, VC, and cis-1,2-DCE. The overall trend indicates a decrease in the contaminants compared to the Five-Year Review Report 1995 data. Some fluctuations in the concentration of the contaminants were noted.

The contaminants 1,1,-DCA, VC, and cis-1,2-DCE (reported as trans-1,1-DCE) did not meet the "Predicted 10-Year Concentration." CA did not meet the "Predicted 10-Year Concentration" through 1997 and the beginning of 1998, but did meet the level for the remainder of 1998, all of 1999, and first quarter 2000. TCE was detected sporadically with wide fluctuations, but did not have a "Predicted 10-Year Concentration" number.

PCE and TCE met the on-site ACLs. 1,1-DCE's MDLs were sometimes higher than the ACL and; therefore, it is not known if the ACL was met.

Well 35M - VC was detected and exhibited wide fluctuations. The overall concentration of VC remained about the same comparing the Five-Year Review Report 1995 data and the current data. Fluctuations from one sampling event to the next exist.

The "Predicted 10-Year Concentration" for VC was obtained.

The ACL for VC for off-site compliance was not met.

Wells 34M, 41M, 44S, 44D, and 24S - No contaminants were detected in any of these wells.

The "Predicted 10-Year Concentration," which was <1 ppb, was met for all these wells.

Although well 24S is on-site, it joined wells 34M, 41M, 44S, and 44D in meeting the only off-site ACL, VC, which is 1 ppb.

Ground Water Data for Additional Monitoring Wells: In addition to the compliance wells, the other ground water wells at the Site were sampled on various dates. The analytical data for additional ground water monitoring wells indicate varying levels of contaminants still persist throughout the Site. (The detailed analytical data are located in Appendix C of the Second Five-Year Review, September 2000.)

Figure 18 from the "Former TRW Inc. Aircraft Components Plant, Minerva, Stark County,

Ohio, 10-Year Review Report, March 2000" identifies the locations of the monitoring wells, recovery wells, and municipal wells as of March 2000. Figure 19 from the same report lists the observed ground water elevations from May 1998.

Analysis of the Secure Cell Data: Between September 1998 and March 1999, methylene chloride was detected in the leachate tank, landfill wells, and surface waters. To assess the presence/absence of the methylene chloride, TRW collected ground water samples from individual landfill wells for analysis, rather than collecting landfill well composites I and II for analysis. TRW conducted the individual landfill well sampling from February through June 1999. In addition to the individual landfill well sampling, TRW sampled three existing monitoring wells (MW-1, MW-2, and MW-17) located in the upgradient ground water flow direction from the Secure Cell during second quarter 1999. The individual landfill well samples, supplemental sampling of monitoring wells MW-1, MW-2, and MW-17, and scheduled monthly post-closure monitoring samples did not detect methylene chloride during May and June 1999. Thereafter, TRW resumed the sampling of landfill well composites, rather than individual landfill wells, and ceased sampling of the supplemental wells during third quarter 1999. To date, methylene chloride has not been detected.

According to Mr. Steve Johnson, U.S. EPA, Region V, Toxics Program Section, the Site was in compliance regarding PCB issues (Personal Communication, June 2000).

Risk Recalculation/Assessment: As determined by the U.S. EPA, a risk recalculation and ecological risk assessment were not needed for the Second Five-Year Review.

Ground Water Extraction System: No major problems with the pump and treat system were reported, since the 1995 Five-Year Review and the 2000 Five-Year Review. Maintenance items on the ground water extraction system were resolved on a continuing basis.

Ground water capture modeling was performed to evaluate the effectiveness of the recovery well network, and quarterly ground water monitoring was performed to evaluate the progress of contaminant removal. The extraction system appeared to be protective of Minerva's municipal wells, but, in some cases, not to the predicted contaminant levels. Table 12 from TRW Inc. March 2000 report is an updated summary sheet identifying predicted ground water contaminants vs. actual contaminants.

Additional Remedial/Investigative Work Performed by TRW Inc.: Since the 1995 Five-Year Review, TRW Inc. has conducted additional investigative and remedial work at the Site. The following are summaries of the additional remedial/investigative work that has been done at the Site, as stated in the "Former TRW Inc., Aircraft Components Plant, Minerva, Stark County, Ohio, 10-Year Review Report, March 2000" document submitted by TRW Inc.

Barn Area
In May 1996, a focused soil and ground water sampling effort was conducted to assess the presence of contaminants in the vicinity of the Barn Area. Continuous soil samples were collected to depths up to 44 feet below ground surface at three locations for analytical testing. Ground water was also sampled from existing wells in the area. Findings from the soil and ground water sampling did not identify a concentrated source area.

Ground Water Capture Modeling
Previous modeling work for this Site was performed by Clement Associates using CFEST model (1986) and O'Brien & Gere using the QUICKFLOW (1992) and TWODAN (1995) models. Camp Dresser & McKee (CDM) expanded on the previous models to develop a three-dimensional model using recent data. The three-dimensional model was used to simulate ground water flow and VOC migration pathways, and to assess the effectiveness of hydraulic plume containment achieved by remedial pumping wells. According to the model, historic pumping rates did not provide full hydraulic capture in the Central Area and; therefore, pumping conditions were changed to provide optimal contaminant capture.

Some contaminant levels in the compliance wells continue to remain above the ACLs. A contaminant transport analysis was performed using the three-dimensional flow model to simulate possible contaminant migration patterns and to assess potential aquifer cleanup times. The transport analysis, as studied by CDM, suggests that residual contaminant mass may be dissolving into the ground water beneath the Site, and the estimated time to reach ACLs could not be assessed. Modeling simulations by CDM suggest once contaminant mass is no longer dissolving in the ground water, aquifer cleanup times are between six years to greater than 15 years. Figure 20 identifies the proposed model boundaries.

Biodegradation Feasibility Determination
In March and May of 1998, additional field investigative work was conducted by TRW to further characterize the ground water flow and biodegradational potential at the Site. Five multi-depth piezometers were installed in March 1998 (MP-1 through MP-5) in the Central Area, Barn Area, and downgradient Central/Barn Area plumes. Data indicate bioremediation is occurring at the Site.

According to CDM, ground water data collected between 1990 and 1999 indicated stable to decreasing concentrations of contaminants, with the contaminants limited to areas upgradient of the city wellfield. CDM suggests the attenuation of contaminant mass across the Site may be due to natural attenuation processes (chemical and biological) and/or physical attenuation processes (ground water extraction). In March 1999, a ground water sampling program was implemented to

support or clarify the findings of potential biodegradation processes. The data, according to CDM, gave support to various attenuation mechanisms, particularly biodegradation. These findings were used to support enhanced bioremediation as a remedial alternative to compliment the existing ground water extraction and treatment system.

Enhanced Bioremediation Activities
To select the appropriate enhanced bioremediation strategy for the Site, a laboratory microcosm study, a field test, and additional field data collection activities were subsequently performed.

Microcosm Study
The microcosm study was performed to evaluate three technologies that included aerobic biodegradation of VC in the downgradient Central/Barn Area plume, oxidation of VC and/or DCE by iron-reducing bacteria, and reductive dechlorination of TCE to ethene under methanogenic conditions. The aerobic and iron reducing studies did not indicate a significant change in contaminant mass over the study duration. However, the methanogenic studies indicated that a vast majority of the contaminant mass was biodegraded, despite minimal production of ethene. Evidence supporting oxidation of VC under iron reducing conditions was gathered with the methanogenic studies. These results support the conclusion that a complete detoxification pathway of VC to innocuous end products under iron reducing conditions exist at the Site.

Chemical Oxidation Study
A preliminary evaluation was performed of chemical oxidation as a treatment remedy for soils containing residual contamination. The data indicate it would not be cost-effective to treat the soils.

Enhanced Anaerobic Biodegradation (EAB)
A field test for EAB was conducted simultaneously with the laboratory studies. A test plot was installed using Hydrogen Release Compound (HRC), a commercial product that releases organic substrate, mainly lactate. The objective of the test plot was to reduce the redox condition of the ground water and demonstrate that complete dechlorination of the contaminants was achieved. The test plot did not demonstrate the desired result. However, findings from the laboratory studies and the field plot data indicated that added substrate (lactate) could be used to stimulate iron-reducing conditions resulting in oxidation of the ground water contaminants.

Field Data Collection and Tracer Study
A field test was conducted to determine if the naturally anaerobic ground water at the

Site could be made aerobic by the introduction of oxygen. Field tests confirm the potential for treatment of VC in the Central/Barn Area plume using an oxygen barrier or other aerobic treatment technology. The laboratory test, however, did not confirm the aerobic biodegradation potential of VC. This is possibly due to a shorter test time span.

Due to unanticipated field results of the EAB test, a tracer study was implemented to determine whether or not the well points within the test plot were hydraulically connected. Results suggest that ground water may have been flowing slightly askew of the wellpoint alignment.

Testing of the soil and interstitial ground water from the test plot soil cores indicated most of the organic material injected (ORC) had been depleted. CDM suspects the rapid ground water flow diluted the slow release of lactate from the ORC.

TRW's Report Summary

The TRW Inc. report states available evidence confirms that various attenuation mechanisms, particularly biodegradation, are contributing to the mass removal of contaminants in the ground water. TRW is continuing to pursue enhanced bioremediation as a technology that should compliment the existing ground water recovery and treatment system.

Compliance Issues: Data analysis indicated TRW has generally been in compliance with the NPDES permit, although the permit was under appeal for five years. There did not appear to be any significant permit compliance problems.

Ohio EPA's Ecological Assessment Section evaluated Sandy Creek in 1993 for a biological and water quality study. The report states: "Biological communities were in full attainment both upstream and immediately downstream from the TRW ground water discharge. No detectable impacts were observed in chemistry, sediment, or fish sampling. The TRW Minerva discharge did not appear to impact water quality." According to Dave Stroud, Supervisor, Division of Surface Water (DSW), Ohio EPA (Personal Communication, June 2000), the 1993 data was the most recent. Ohio EPA, DSW, was not aware of any problems with Sandy Creek at the location of the Site, at this time.

TRW was in compliance with the air permit (as per Jim Brown, Canton Air Agency) (Personal Communication, June 2000).

Operations & Maintenance (O&M) Costs (Previous): The following was an estimated annual costs for O&M, based on historical/budgetary numbers provided by TRW Inc:

	Secure Cell	GW Extraction System
Utilities	$ 1,000	$ 30,000
Labor/Corp chgs.	20,000	50,000
Consultants	10,000	30,000
Analytical	15,000	40,000
Elec. Maintenance	2,000	12,000
Drilling Well Subs.	0	10,000
Equip. & Supplies	1,000	15,000
Other/Misc.	1,000	13,000
TOTAL	$50,000	$200,000

O&M Costs (Current): The following are the O&M costs for 2004, budgeted 2005 costs, and future projected costs:

TRW O & M Costs

Task No	Descriptions	Assumptions	2004	2005
1.00	**O&M GW Treatment System**			
1.01	NPDES Permit Fee	NPDES annual fee is about $6000/yr; from Treasurer State of Ohio;	$6,000	$6,000
1.02	Utilities	Electricity (AEP) $2,000/mo (Plant and Stadium Recovery Well) = $24,000/yr; Telephone (Verizon) $110/mo = $1300; AT&T; Minerva water and sewage = $106/yr	$26,000	$26,000
1.03	Recovery Wells M & R	Annual: Clean 2 wells per year = $10000/yr; and panel repair = $500/yr; Total $10,500/yr. Start in 2003	$10,500	$10,500
1.04	Tower M&R	Annual: Hilscher-Clarke Electric Contractors @ about $5000/yr for general repair (includes periodic replacement of transducers); Clean Packing $15,000 Total $20000 annually.	$20,000	$20,000
1.05	Facility Grounds M&R	Grass Cutting	$9,500	$9,500
1.06	Labor	General O&M	$6,000	$6,000
1.07	Disposal		$2,000	$2,000
1.08	Property Taxes		$620	$620
1.90	Subtotals		$80,000	$80,000
2.00	**Monitoring Groundwater**			
2.01	Sampling -STL		$8,000	$8,000
2.02	Lab Analysis - STL	AirTower = $1608 Rem Wells = $2680 Other = $1300	$5,600	$5,600
2.03	NPDES Monthly Reports		$1,000	$1,000
2.06	ACL Compliance Well Reporting		$5,200	$5,200
2.11	Task Management		$8,000	$3,000
2.90	Task 2.0 Subtotals		$27,800	$22,800
3.00	**Monitoring Secure Cell**	**Thru 2015; Then Post Closure**		
3.01	Sampling-STL		$8,000	$8,000
3.02	Lab Analysis - STL	LFWells Ind = $3900 LFWells Cmp = $1600 Leach Tank = $1944 SCell Rem Wells: $1330 Sediment = $560 Stream = $1296	$7,200	$7,200
3.03	Annual Secure Cell Post-Closure		$5,000	$ 5,000
3.04	Property Taxes		$700	$ 700
3.90	Task 3.0 Subtotals		$20,900	$20,900
	Totals		$128,700	$123,700

V. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

Protectiveness Statements Summaries from the Second (2000) Five-Year Review

Surface Soil and Sediment Cleanup

The Secure Cell appeared to meet the objectives of the Consent Agreement as intended. The ground water monitoring wells surrounding the cell did not show a release to the environment.

Ground Water Investigation and Remediation

The ground water extraction system appeared to be containing the contaminants. Some of the ACLs and the "Predicted Ten-Year Concentrations" were not met; however, there appeared to be an overall decrease in some of the contaminants in the compliance wells. Compliance well data indicated wide fluctuations of some of the contaminants in the compliance wells.

At the time of this review and with limited residential well testing conducted in 1996, the remedy appeared to be protective. As detailed in the Deficiencies and Recommendations Sections of the 2000 Report, there are residential wells that are used for a primary source of drinking water and other wells that are used for a secondary water source (i.e. swimming pool, gardening, etc.) in the vicinity of the Site. These wells are not sampled routinely for contamination and appeared to be potentially at risk. Also, new residential wells continued to be installed in the vicinity of the Site. Institutional controls were needed to address ground water use downgradient from the Site. Lacking institutional controls, the existing ACLs may be inappropriate.

Recommendations from the Second (2000) Five-Year Review

As per U.S. EPA, the "Recommendations" section identified the follow-up action for each "Deficiency," including identifying the party responsible for implementation. In addition to addressing the "Deficiencies," additional recommendations are presented below. The "Recommendations" were divided into (1) addressing the Deficiencies, (2) General Recommendations, (3) Prior to Shut Down of the Ground Water Extraction System, (4) Cost Saving Measures for the Secure Cell, and (5) Cost Savings Measures for the Ground Water Extraction System. Below each recommendation is the follow-up action that has occurred, since the Second (2000) Five-Year Review was completed.

Recommendations for Deficiencies:

The following are Recommendations addressing the previously listed Deficiencies from the First (1995) Five-Year Review:

1. All residential wells that are used for a primary source of drinking water should be sampled for volatile organics on an annual basis, or connected to the municipal water supply and have the well properly abandoned. The Stark County Health Dept. has jurisdiction over residential well installations in Stark County, and TRW Inc. is responsible for ground water cleanup. The Stark County Health Dept. should (1) re-evaluate permitting installation of new residential wells in this area and, if they continue to allow installation of new wells, require mandatory sampling, and (2) with or without TRW support, implement a mandatory monitoring program. TRW Inc. and the Stark County Health Dept. should work together to implement a monitoring program for the residential wells, or (3) connect the residents to the municipal water supply and require the wells to be properly abandoned.

   Institutional controls are not in place to ensure the protectiveness of the residential wells. TRW should implement institutional controls that will demonstrate that all and future residential wells will be protected. Consideration should be given to moving the compliance points to the property lines.

   The ACLs may be inappropriate for the residential wells. New residential wells are permitted to be installed in the area. According to TRW, the ACLs were developed using the location of the municipal water wells and the residential well locations at that time of the Order as the compliance points. These well locations have changed; new, additional wells have been installed over the years. TRW should demonstrate that the ACLs are protective of all current and future residential wells.

Follow-Up Action: Several Meetings were held with TRW Minerva, Stark County Health Dept., and Ohio EPA. A summary of these meetings and actions taken, are discussed below under "Additional Investigations by TRW."

2. All remaining residential wells at homes that have been hooked up with Minerva city water should be properly abandoned, unless used for ground water monitoring purposes. If used for monitoring purposes, the wells must be locked. The wells not used must be abandoned according to the Stark County Health Department's well abandonment procedure. If the wells

remain as a secondary water source, they should be routinely sampled and back flow preventers should be installed on the wells. The Stark County Health Dept. has jurisdiction over residential wells and well abandonment, and TRW Inc. is responsible for ground water cleanup. TRW Inc. should assist the Stark County Health Dept. in addressing this issue.

Follow-Up Action: Several Meetings were held with TRW Minerva, Stark County Health Dept., and Ohio EPA. A summary of these meetings and actions taken are discussed below under "Additional Investigations by TRW."

3. The high MDL issue should be addressed by TRW, Inc. and the laboratory. A discussion between TRW and the laboratory to resolve this issue and develop possible solutions is suggested. A possibility may exist that the laboratory may require an additional sample from the same suspect well that could be analyzed separately with the lower detection limit, without matrix interference.

Follow-Up Action: The MDL has been lowered and is acceptable.

4. The DYNFLOW Ground Water Model is currently under review by Ohio EPA. It is anticipated that TRW Inc. will respond to all Ohio EPA concerns until this or another model is approved. TRW Inc. is responsible for the ground water model submittal to Ohio EPA, which is the approvable Agency.

Follow-Up Action: TRW Inc. submitted additional modeling data to Ohio EPA.

5. There are no bedrock wells installed at the Site or in other areas of concern. The initial report detected VOCs down to bedrock. Potential residual DNAPL contamination may exist at the Site. Installation by TRW of bedrock wells would define rate and extent of contaminant levels in the deeper zone.

Follow-Up Action: The current source investigation has included the installation of two wells close to the top of bedrock (about 150 feet), to help define the vertical extent of the source area. Sampling ports are located about 30 feet apart .

General Recommendations:

6. The contaminants trans-1,2-DCE and cis-1,2-DCE can be degradation products. The contaminant trans-1,2-DCE is specified as an ACL, but has not, within this second Five-Year Review time frame, been detected in the ground water; however, cis-1,2-DCE consistently has been detected. TRW

has been reporting cis-1,2-DCE as trans-1,2-DCE in the analytical data, since no trans-1,2-DCE was detected (with a footnote). The Work Plan in the Subsurface Order should be changed to include cis-1,2-DCE as an ACL. The contaminant trans-1,2-DCE should remain as part of the Order and should continue to be tested and reported, potentially it may be detected in the future. The MCL for cis-1,2-DCE is 70 ug/L. Ohio EPA and TRW Inc. should address this subject.

Follow-Up Action: The two constituents are reported separately; however, no ACL is listed.

7. In addition to the compliance point wells, TRW Inc. should also sample all remaining wells that make up the monitoring system once a year for volatile organic compounds. Data (Appendix C) indicate other monitoring wells have varying concentrations of contaminants that have been detected within the last five years. This will (A) help track contaminant levels at the Site and other affected areas; and(B) evaluate the new model's (DYNFLOW) predicted capture zone, to enable fine tuning of the extraction system. Static water levels and a ground water flow map should be included with the data. This data may indicate a need to re-evaluate the sampling plan and the ACLs.

Follow-Up Action: TRW has not sampled all monitoring wells. As part of the current source investigation, new monitoring wells have been installed. A map identifying the current monitoring well network and well locations is included in this report in Appendix F.

8. Possible residual contamination in the vadose zone may exist at the Site and be a plausible explanation for the variability of ground water data. TRW Inc. may still want to explore this premise as a viable reason for the data variability.

Follow-Up Action: The current source investigation indicates this is not the case.

9. Monitoring well 13 is specified as one of the compliance point wells; however, this well is usually dry. When well 13 is dry, TRW has been substituting monitoring well 13B in its place for sampling. The ground water monitoring wells 13 and 13B are in close proximity to each other and similar in depth. In order to provide accurate trend data, the Work Plan in the Subsurface Order should be changed to make well 13B one of the compliance point wells. Well 13 should be used for static water level measurements (when not dry) and, in the event of the GET shutdown, could be used for sampling.

Follow-Up Action: TRW is still sampling wells 13 and 13B.

10. The laboratory should note the dilution factor on the bottom of the analytical data sheets and, in turn, this should be included on all raw data, summary lab sheets, etc., to Ohio EPA and the Minerva repository file.

Follow-Up Action: Ohio EPA is unaware if this item has been addressed.

11. The security and maintenance of the ground water monitoring wells were inspected by Ohio EPA. It was noted that many are without locks, well caps (where applicable), and identifying numbers. Many showed signs of rusting. One well was incapable of closing completely. Many of these wells are in accessible locations, located off-site (i.e., backyards), and open to vandalism. All monitoring wells must be inspected, maintained, and secured by TRW.

Follow-Up Action: A 2004 Monitoring well inspection by Ohio EPA noted some cracked aprons and other maintenance issues. Wells lacked identifying numbers. Due to flooding in the area during 2003 and 2004, several wells were impacted. TRW indicated to Ohio EPA that maintenance issues are currently being addressed.

Recommendations for Post Mandatory Requirements: TRW Inc. would be the responsible party to address the following items under this category:

Follow-Up Action for # 12 and # 13 has been deferred until the current source investigation, etc., has been addressed.

12. TRW Inc. has not yet met the requirements to turn off the extraction system; however, this is their goal. The Consent Order states the GET system shall be operated until four quarters of monitoring data demonstrate compliance with one (or a combination) of the performance standards (background, MCLs, and/or ACLs). Due to the ground water usage, the known contaminants, the residual contaminated soils left in place, data fluctuation patterns, the geology, etc., the levels may fluctuate and increase once the GET system is turned off. Data indicate that the extraction system is containing the contamination and plume. Minerva's well field has shown no impact. Prior to GET system shutdown, a long-term ground water monitoring program is needed. The Monitoring system should be designed and implemented to monitor the contaminant levels and detect and prevent any contaminant migration. This would consistently re-evaluate the operational need of the GET system at the Site. Additional information may be required

for evaluation.

Contamination has been detected to bedrock in initial reports. Vinyl chloride has reportedly been detected in ground water at depths of 90 feet in the aquifer near well 35m. There are no monitoring wells screened at a depth of greater than sixty feet. None of the extraction wells are completed at depths greater than 75 feet. There are no bedrock wells to monitor and detect potential contaminant migration. Prior to GET system shutdown, the installation and sampling of bedrock wells should be included as part of the monitoring system, to protect the residential wells, Minerva's water supply, and to monitor residual contaminants and the plume.

13. The ACLs established through the Consent Order are normally granted through a RCRA permit application and must demonstrate that the hazardous constituents detected in the ground water will not pose a substantial present or potential hazard to human health or the environment at the ACL levels. The 19 factors, or criteria, that are used to evaluate ACL requests are listed in 40 CFR Section 264.94(b) of the regulation and must be adequately discussed by the facility. The U.S. EPA OSWER Directive 9481.00-6C/EPA/530-SW-87-017 Alternate Concentration Limit Guidance, Part 1, ACL Policy and Information Requirements, Interim, Final, dated July 1987, provides further guidance on establishing ACLs. The Supplemental Groundwater Feasibility Study by Clements Associates, Inc. (November 1986) states 10^{-6} risk level would be used to develop cleanup levels at the Site. This was not adequately demonstrated in the risk assessment submitted as part of this document. Based on the data used to establish Maximum Contaminant Levels (MCLs) in drinking water under the Safe Drinking Water Act and the State of Ohio ORC 6109 and OAC 3745-81 Drinking Water Standards, the MCLs should be used as the cleanup standards for ground water. If no MCL exists for a specific constituent, "Risk Assessment Guidance for Superfund" (RAGS) should be used to calculate and demonstrate that the risk levels are 10^{-6}. In the event the GET system is turned off, Ohio EPA will require some type of demonstration that the contaminant levels at shut off time (as well as possible fluctuating increases) will be protective of all receptors (i.e., residential wells and municipal wells).

Recommendations for cost savings for the Subsurface Order (ground water) that will be considered after meeting compliance with the recommendations that have been listed above:

14. Sampling procedures should be reviewed by TRW Inc. and Ohio EPA. With the correct procedure verified, eliminate replicate sampling and analysis

(unless needed by the laboratory).

Follow-Up Action: This has not been implemented.

15. Monitoring wells 24S, 44D, 44S, 41M, and 34M did not detect any contamination (MCL was <1 ug/L) inclusive of analytical date from second quarter 1995 through first quarter 2000. It is recommended that as long as the GET system is operational, that these wells be sampled once a year.

Follow-Up Action: This has not been implemented.

Recommendations for Cost Savings for Surface (Secure Cell) Order that will be considered after meeting compliance of the recommendations that have been listed above:

16. Based on the majority of non-detects in the analytical data, reduce the semi-annual sediment monitoring at the two sampling locations to annual monitoring.

Follow-Up Action: This has not been implemented.

17. Currently, TRW is providing quarterly reports to Ohio EPA regarding the Secure Cell and annual reports to U.S. EPA and Ohio EPA. The information in the quarterly reports is the same information presented in the annual report. Eliminate the quarterly reports and provide annual reports to U.S. EPA and Ohio EPA.

Follow-Up Action: Quarterly sampling is provided to U.S. EPA and Ohio EPA in an annual report.

Additional Investigations by TRW Minerva

(1) Source Areas Investigation

In March 2002, TRW Minerva submitted the "Phase II Source Area Investigation Report" to Ohio EPA. Ground water contaminant levels have consistent fluctuations of contamination above the applicable cleanup criteria, which suggested that a source or sources may exist at the Site that may be contributing to the contaminant fluctuations. TRW made the decision to investigate the possibility of unidentified sources, targeting the former wax ditch area (central area) and barn area.

The report states the highest detections of VOCs were observed in the shallow ground

water samples around the former wax ditch area. The ground water sampling detected: TCE at 56,000 ug/L; TCA at 21,000 ug/L; cis-1,2-DCE at 1,900 ug/L; and total 1,2-DCE at 2,100 ug/L. Ground water sampling around the barn area also showed elevated levels of VOCs. The highest levels of contaminants detect in soil were PCE at 67,000 ug/kg, TCE at 340,000 ug/kg, and cis-1,2-DCE at 9,800 ug/kg. In response to this report, Ohio EPA requested TRW to define the rate and extent of contamination in the Central and Barn Areas, and design and implement a remedy for these source areas. TRW responded with a time table to accomplish these tasks. After the initial work completed in 2001, TRW made the following conclusions:

* Residual VOCs are present primarily within the capillary fringe and saturated zone below the area of the former Wax Ditch and former South Pond.

* The uppermost deposits (i.e., unsaturated zone) do not appear to be the source of VOCs recharging the ground water. The highest VOC concentration in ground water occurs in the top 5 - 10 feet of the saturated zone [or 15 feet below ground surface (bgs)] within or in close proximity of the former wax ditch area.

After evaluating the data from the work performed through 2004, TRW concluded that additional work must be performed to define adequately the extent of the source area. This work is planned to continue in both the Barn and Central Areas through summer 2005. Copies of these correspondences and six Figures that depict the estimated TCE distribution in the soils at both the Barn and Central Areas are included in Appendix A.

(2) Minerva Residential Well Users

Several Meetings were held with the TRW Project Manager, Stark County Health Dept., and Ohio EPA to discuss recommendations concerning residential well users made by Ohio EPA in the Second (2000) Five-Year Review. The group set a working goal to eliminate residential well use in the area of Minerva, where VOC constituents released from the former TRW manufacturing operations impact ground water. Agenda items included defining the extent of the impacted area; identify residential well users in the defined area and obtain information on their wells and well use; develop a ground water sampling and analysis plan; develop well closure options and closure criteria; closure actions; and follow-up actions.

TRW conducted a comprehensive survey of residential well users in the vicinity of the Site. After identifying the potentially impacted area, TRW mailed a questionnaire to every address located within that area. Non-responders were followed-up with a door-to-door visit from TRW. Over 250 responded to TRW's questionnaire and 11 did not respond.

Questions asked included if a well was located on the property and, if so, was it in use and for what purpose. The current well owners indicated there are 14 wells that are not used. There are 15 wells that are used for other purposes (i.e., swimming pools, gardening, etc.) and approximately 10 wells that used for the potable water supply. There were several people that indicated the well was used for everything else but drinking (i.e., cooking, bathing, etc.).

Currently, Stark County Health Dept., TRW Minerva, and Ohio EPA are working together to resolve the residential well issues. Included in Appendix B is TRW's list of the responders, the non-responders, the current well owners, and a location map of the residential wells.

VI. FIVE-YEAR REVIEW PROCESS

Administrative Components

The team members that made up the Third (2005) Five-Year Review were Gladys Beard, Remedial project Manager (RPM), U.S. EPA, Region 5; Steve Johnson, Toxics Program Section, U.S. EPA; Dave Bowland, Division of Drinking and Ground Waters (DDAGW), Ohio EPA; Phil Rhodes, Division of Surface Water (DSW), Ohio EPA; Dave Stroud, DSW, Ohio EPA; Steve Jackson, Village of Minerva, Water Dept.; Pat Shriver, Canton Air Monitoring Dept.; William Franks, Health Commissioner, Stark County Health Dept.; and Vicki Deppisch, Division of Emergency and Remedial Response (DERR), Ohio EPA. Mr. Paul Jack, Project Manager for TRW Minerva, also contributed to this report.

Ms. Marie Wolf, Community Advisory Spokesperson, was advised that Ohio EPA was conducting the Third (2005) Five-Year Review in a letter, dated November 23, 2004 (Appendix D).

The review schedule included the following:

* Community Involvement;
* Document Review (includes the recent TRW Investigative Work);
* Data Review;
* Site Inspection;
* Ground Water Monitoring Inspection;
* Local Interviews;
* First (1995) and Second (2000) Five-Year Reviews Review;
* Five-Year Review Report and Development and Review.

Community Involvement

In addition to advising Ms. Marie Wolf, Community Advisory Spokesperson, via mail that Ohio EPA was conducting the Third (2005) Five-Year Review, a meeting was held to discuss the Five-Year Review Process and discuss her concerns and current knowledge of the Site. A Public Notice was placed in the local paper, *The Repository*, on Wednesday, February 2, 2005, soliciting knowledge on current site conditions, problems, or related concerns (Appendix D). Meetings were held with the Stark County Health Dept. officials, Village of Minerva's Water Dept., and TRW's Project Manager. The TRW Minerva Repository was visited, documents located and checked, and library staff members advised of the Five-Year Review.

Document Review

This Five-Year Review consisted of a review of all documents listed in the reference section, the quarterly monitoring reports for the ground water (subsurface) Consent Order from August 2000 through May 2005, the Secure Cell yearly post-closure monitoring reports for the PCB Secure Cell (surface) Consent Order from 2000 through 2004, and the two Ohio EPA Consent Orders.

Site Inspection

Inspections at the Site were conducted on October 7, 2004 and October 13, 2004. The purpose of the inspections were to assess the protectiveness of the remedies, including the condition of the fencing to restrict access, the integrity of the cap on the Secure Cell, and the monitoring/extraction system. In detail, the site visit consisted of an inspection of the Secure Cell's cover, monitoring wells, lysimeters, and fencing; and the extraction system's monitoring wells (both on and off the property), the recovery wells, air stripper ground water extraction system, and fencing. Also included was a document review, updates on current conditions, permit requirements, and any changes in general that have occurred over the last five years.

No significant issues were identified during the inspection. The ground water monitoring wells were in need of routine maintenance and some showed an impact from several floods that had occurred in the area. The extraction system, operating on a continuing basis, was fully operational. The fencing around the Secure Cell and the extraction system was intact. The Secure Cell cap was intact and mowed. The fenced grounds encompassing the extraction system were maintained and mowed. The gates were locked.

As stated earlier in this report, as per TRW Minerva Project Manager, there are no

institutional controls in place on the property for the Secure Cell or the Ground Water Extraction Treatment System and, consequently, a review from the County offices was not conducted. There are currently no potable water wells on the Site; municipal water is used. The site inspection checklists for the Secure Cell (PCBs) and the Ground Water Extraction Treatment System is located in Appendix C.

Interviews

Interviews were conducted with persons connected to the Site. Ms. Marie Wolf, Community Advisory Spokesperson, was interviewed on May 11, 2005. Overall, Ms. Wolf thinks the remedies are effective, especially the extraction system, which appears to be protecting Minerva's municipal water supply. She continues to be concerned about the safety of the municipal water supply, if and when the extraction system is turned off. She is not aware of any events, incidents, or activities that have occurred during the last five years that may have caused a problem at the Site. She indicated she was well informed by TRW Minerva and Ohio EPA personnel and that current site activities appeared to be going smoothly. Consequently, she did not have any comments, suggestions, or recommendations regarding the Site's management or operation (Appendix D).

Mr. Paul Jack, TRW Minerva's Project Manager, was interviewed on October 13, 2004, during a site inspection. His interview responses have been incorporated into the updated information that has been included in the "Five-Year Review Site Inspection Checklists" for the Secure Cell and the Extraction system located in Appendix C.

Surface Soil Cleanup Order (PBCs) - Secure Cell - Data Review

The annual reports for the TRW Minerva Secure Cell (PCBs) are submitted to Mr. Steve Johnson, U.S. EPA, Toxics Program Section. U.S. EPA has regulatory authority over PCBs. Copies of the reports are forwarded to Ohio EPA. Ohio EPA reviewed the following reports:

2000 Secure Cell Yearly Post-Closure Monitoring Report (prepared May 2001);
2001 Secure Cell Yearly Post-Closure Monitoring Report (prepared May 2002);
2002 Secure Cell Yearly Post-Closure Monitoring Report (prepared May 2003);
2003 Secure Cell Yearly Post-Closure Monitoring Report (prepared May 2004); and
2004 Secure Cell Yearly Post-Closure Monitoring Report (prepared May 2005).

In addition, Ohio EPA and U.S. EPA, Toxics Program Section, reviewed Ohio EPA's Administrative Order on Consent, dated June 5, 1985, and the U. S. EPA Amended Approval Conditions and Waivers, dated August 2, 1985.

In September of 2000, field personnel indicated that the lysimeters were in poor condition and were no longer performing adequately. Specifically, the lysimeter tubing was cracked, pressure gauges were rusted, and a vacuum could no longer be obtained in the lysimeters. Therefore, lysimeter measurements have not been included in the reports.

It is the understanding of Ohio EPA that the leachate quantity in the 2000 and 2001 reports included purged water from the monitoring wells. The purged water was not added to leachate after the 2001 report. The 2003 and 2004 reports show a substantial increase in leachate quantity, which may be attributed to storms and flooding that occurred during these years. The increase of leachate quantity during 2003 and 2004 is suspect and may indicate a failure in the cap/cell. In addition, chlorinated organics were detected of various concentrations.

Ground water elevations were not taken for monitoring wells 13 and 20. Ground water flow maps were not provided in the reports. Monitoring wells MW-13, MW-19A, and MW-20 were not sampled for PCBs.

The analytical method and Method Detection Limit (MDL) were not included in each report. A map identifying the locations of the Secure Cell, main buildings, leachate tank, lysimeters, identified (number or letter) monitoring wells, etc., was not included in the reports.

Methylene chloride was detected in various samples in many of the reports and is a common laboratory contaminant. Dibromochloromethane and some other compounds were also detected at low levels. The reports should evaluate the detection of these constituent and, if data suggests, indicate a possible source (i.e., laboratory contaminant).

The U.S. EPA approval condition 36 states, "Background water samples shall be taken from monitoring wells f and h described in approval condition number 4, before placement of the PCB-contaminated materials into the secure landfill." Background levels cannot be located.

Report Summaries

2000 Report: Monitoring wells: PCB-1260 was detected at a concentration of 2.4 ug/L in landfill well D in September 2000. PCB-1016 was detected at a concentration of 15 ug/L in the August 2000 composite II sample.

Leachate: Monthly monitoring of the leachate in the leachate storage tank detected 1,1,1-trichloroethane averaging between less than 10 ug/L (April 2001) to 31 ug/L (June 2000); 1,1,-dichloroethane was detected between 330 ug/L (December 2000) to 680 ug/L (March 2001); and cis-1,2-dichloroethene was detected at 19ug/L (March 2001). The volatile organic compounds may be attributed to the addition of

purged water or a problem with the cell. The total leachate volume increase was 642.16 gallons.

PCBs were not sampled for monitoring wells 13B, 13, 19A, and 20. Monitoring well 13 and 13B were sampled on different dates; sampling should have occurred from well 13 for both samples.

2001 Report: Monitoring wells: No PCBs or volatile organic solvents were detected above the MDL.

Leachate: The leachate storage tank detected various volatile organics including 1,1,1-trichloroethane, 1,1,-dichloroethene, cis-1,2-dichloroethene, and chloroethane with various ranges. These may be attributed to the addition of purged water or a problem with the cell. The total leachate volume increase was 246.23 gallons.

The report indicates "NA" for some of the water elevations. The "NA-Not available" should be explained in the report. Some entries in the data summary charts indicate <1J. This value should be explained.

2002 Report: Monitoring wells: PCBs and chlorinated solvents were not detected about the MDL.

Leachate: No leachate was generated between May 2002 and April 2003.

2003 Report: Monitoring wells: No PCBs or chlorinated solvents were detected above the MDL.

Leachate: No leachate was generated in May and June of 2003. Leachate was detected in July 2003 through April 2004. Concentrations of 1,1,1,-trichloroethane, 1,1-dichloroethane, cis-1,2-dichloroethene, chloroethane, PCB-1248, PCB-1254 (470 ug/L), and PCB 1260 were detected in the leachate tank. The report notes that extensive flooding occurred in May 2003. Total leachate volume increase was 1,455 gallons.

2004 Report: Monitoring wells: Low levels of 1,1,1-trichloroethane, and 1,1-dichloroethane were detected in landfill well I in September 2004 and March 2005. Composite II sample in October 2004 detected 1.2 ug/L of 1,1-dichloroethane.

Leachate: Concentrations of 1,1,1-trichloroethane, 1,1,-dichloroethane, cis-1,2-dichloroethene, chloroethane, PCB-1248, PCB-1254, and PCB-1260 were detected

in the leachate tank. Total leachate volume increase was 2,508 gallons.

Reporting Requirement Discrepancies Between TRW Reports and Ohio EPA Consent Order

Leachate production, adjusted for temperature and evaporation considerations, was not graphed against time and climate conditions to determine the overall performance of the cell.

Reporting Requirement Discrepancies Between TRW Reports and U.S. EPA Approval Conditions and Waivers

1. Ground water table maps were not included with the reports.

2. The suction lysimeters could not be checked monthly for the presence of any free liquids, due to structural failure.

According to Steve Johnson, U.S. EPA (Personal Communication, August 2005), noncompliance issues (i.e., lysimeters, etc.) should be discussed and the TSCA Permit re-evaluated.

Subsurface Order - Compliance Point Wells and Extraction System Review

Quarterly data were reviewed for the ACL compliance point monitoring wells between August 2000 and May 2005.

Compliance Point Wells

Monitoring Well 13 (13B): Overall, there is a slight trend downward for the contaminants in this well, since the last Five (2000) Year Review. The analytical data continues to show fluctuating contaminant levels. Vinyl chloride remains above the ACL of 2 ug/L level.

Monitoring Wells 24S, 44S, 44D, 41M, and 34M: No VOCs were detected in any of these wells. No VOCs were detected in these wells for the last (2000) review.

Monitoring Well 35M: The overall trend for this well remains the same; the major consistent contaminant detected was Vinyl chloride. Data fluctuations were noted. Vinyl chloride remains above the ACL of 1 ug/L level.

Monitoring Well 19A: The overall trend remain the same; however, more

detections of TCE were noted. Data fluctuations were noted. Vinyl chloride remains above the ACL of 2 ug/L level.

Monitoring Well W4M: The overall trend remains the same with noted fluctuations.

The ACLs and contaminant levels associated with each of the above compliance point wells are presented in Table 13.

ACL Compliance Point Monitoring Wells Data (2000-2005) Compared to Predicted Concentrations

The Predicted Ground Water Concentrations for 1 year, 5 years, and 10 years is stated in Table 6.

Monitoring Well 13: Contaminant concentrations met the 10 year predicted levels except for VC. The 5-year predicted level was 30 and the 10 year predicted level was 6 ug/l. The data reviewed had wide fluctuations and ranged from 34 ug/L to <1 ug/L. The 34 ug/L did not meet the higher 5-year predicted level and three other values did not meet the 10 years predicted level.

Monitoring Well W4M: The predicted levels for PCE were 190 ug/L for 1 year, 25 ug/l for 5 years, and 5 ug/l for 10 years. The data ranged from 100 ug.l to 54 ug/L. All 20 results were above the 5 year predicted level. The predicted levels for TCE were 200 ug/L for 1 year, 25 ug/l for 5 years, and 5 ug/L for 10 years. The data ranged from 21 ug/L to 3.2 ug/L. All 20 results were above the 10 year predicted level. The predicted levels for 1,1-DCA were 30 ug/L for 1 year, 30 ug/l for 5 years, and <1 for 10 years. Data ranged from 13 ug/L to 1.3 ug/L. All 20 results were above the 10 year predicted level.

Monitoring Well 35M: This well met the predicted 10 years of 17 ug/l for VC. The data ranged from 9.6 ug/L to <1 ug/l. This is the only contaminant for this well.

Monitoring Well 19A: The predicted levels for VC were 150 ug/L for 1 year, 4 ug/L for 5 years, and 1 ug/L for 10 years. The data ranged from 47 ug/L to 1.5 ug/L. Eighteen results were above the 5 year predicted level and 2 were above the 10 year predicted level. The other contaminants met the predicted 10 years levels.

Monitoring Wells 24S, 34M, 41M, 44S, and 44D: No contaminants were initially detected in these wells. No contaminants were detected during this sampling period.

Extraction System

Periodic flooding in the area caused the extraction system to be shut down temporarily several times. Flooding occurred in 2003 and 2004. Routine maintenance continues to be conducted. The extraction system appears to contain the contaminants; no VOCs were detected in the municipal wells during the one required sampling event. It is unknown about the residential wells in the potential impacted zone, as the ground water is not sampled on a routine basis.

Ground Water Monitoring Wells

The ground water monitoring wells were inspected during the site visits. Some wells were in need of routine maintenance (i.e., cracked aprons, etc.). TRW was made aware of these findings and is currently correcting these items. All wells should have an identifying number painted on it. A map identifying the well locations of the current ground water monitoring system is located in Appendix F.

Residential Wells

The residential wells in the vicinity of TRW continue to be a concern. No wells were tested during the time frame of this review. As stated earlier in this report, several meetings were held with the TRW Project Manager, Stark County Health Dept., and Ohio EPA to discuss recommendations concerning residential well users made by Ohio EPA in the Second (2000) Five-Year Review. The group set a working goal to eliminate residential well use in the area of Minerva where VOC constituents released from the former TRW manufacturing operations impacted ground water. Agenda items included defining the extent of the impacted area; identifying residential well users in the defined area and obtaining information on their wells and well use; developing a ground water sampling and analysis plan; developing well closure options and closure criteria; closure actions; and follow-up actions.

TRW conducted a comprehensive survey of residential well users in the vicinity of the Site in 2004. After identifying the potentially impacted area, TRW mailed a questionnaire to every address located within that area. Non-responders were followed-up with a door-to-door visit from TRW. Over 250 responded to TRW's questionnaire and 11 did not respond. Questions asked included if a well was located on the property and if so, was it in use and for what purpose. The current well owners indicated there are 14 wells that are not used. There are 15 wells that are used for other purposes (i.e., swimming pools, gardening, etc.) and approximately 10 wells that are used for the potable water supply. There were several people that indicated the well was used for everything else but drinking (i.e., cooking, bathing, etc.).

According to the Stark County Health Dept., no new residential wells can be installed if an existing municipal waterline and hookup exists next to the property. Conversely, residential wells can be installed where no municipal waterline or hookup exists. Stark County Health Dept., TRW Minerva Project Manager, and Ohio EPA are evaluating this area and comparing it to the potentially impacted area.

Currently, the Stark County Health Dept., TRW Minerva, and Ohio EPA are working together to resolve the residential well issues. Included in Appendix B is TRW's list of the responders, the non-responders, and the current well owners, and a location map of the residential wells.

Village of Minerva Drinking Water Supply Wells

In 1998, the Village of Minerva changed from the required yearly VOC sampling to once every three years (2001, 2004). As per Steve Jackson, Village of Minerva Water Dept, untreated water samples are collected as close to the spigot as possible. There are three municipal wells and each well is sampled. Two wells are 50 feet bgs and the third is 60 feet bgs. Two wells are run at the same time, rotating between the three wells. No VOCs were detected in the 2001 or 2004 analytical results.

Applicable or Relevant and Appropriate Requirements (ARARs) Review

Five-Year Review guidance established policy for U.S. EPA to review and analyze the remedial action at a site as it is affected by newly promulgated or modified federal and state environmental laws. Applicable or relevant and appropriate requirements (ARARs) associated with the construction and long-term maintenance and monitoring of the remedial action at the Site were not (except for MCLs) addressed in the Consent Order, because the Consent Order is a State Order. ARARs for the site remedy are as follows:

1. Safe Drinking Water Act (SDWA), 40 CFR Parts 141-143. Establishes Maximum Contamination Levels (MCLs) for ground water remediation.

2. Ohio Revised Code (ORC) 6109 and Ohio Administrative Code (OAC) 3745-81 Drinking Water Standards.

3. National Pollution Discharge Elimination Permit - Ohio Permit Number 31D00060*DD (issue date 10/30/03, effective date 12/01/03, and expiration date 11/30/08)

4. ORC 6111. Prohibits pollution of waters of the State of Ohio.

5. OAC 3745-33. Ohio NPDES permits.

6. OAC 3745-1. Ohio water quality standards.

7. Ohio Air Permit To Install (PTI) 15-357 issued April 22, 1987. Premise number 1576151574 (source identification-air stripper).

8. OAC 3745-31. Ohio Air Permits to Install New Sources.

9. Clean Air Act for air stripper requirements.

10. Clean Water Act for NPDES discharge requirements.

11. Toxic Substances Control Act (TSCA) 40 CFR Section 761.

Table 5 identifies the ACLs and MCLs for the Site as they are identified in the subsurface (ground water) Order.

Compliance with Applicable or Relevant and Appropriate Requirements

Data analysis indicates that TRW has been in compliance with the NPDES permit. A copy of the permit is located in Appendix E.

No new assessments of Sandy Creek have been conducted by Ohio EPA. Ohio EPA's Ecological Assessment Section evaluated Sandy Creek in 1993 for a biological and water quality study. The report states: "Biological communities were in full attainment both upstream and immediately downstream from the TRW ground water discharge. No detectable impacts were observed in chemistry, sediment, or fish sampling. The TRW Minerva discharge did not appear to impact water quality." According to Dave Stroud, Supervisor, DSW, Ohio EPA (Personal Communication, June 2005) the 1993 data was the most recent. Ohio EPA, DSW, was not aware of any problems with Sandy Creek at the location of the Site, at this time.

Pat Shriver, Canton Air Agency, was not aware of any problems regarding air emissions at the TRW Site (Personal Communication, April 2005).

VII. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Secure Cell (PCBs)

The U.S. EPA has indicated that there are non-compliance issues (i.e., lysimeters, etc.) with the TSCA permit regulations. The ground water monitoring wells surrounding the Secure Cell have not indicated an impact to the environment. The cause of the increased leachate quantity should be evaluated. It is the understanding of Ohio EPA that the leachate quantity in the 2000 and 2001 reports included purged water from the monitoring wells. The purged water was not added to leachate after the 2001 report. The 2003 and 2004 reports show a substantial increase in leachate quantity, which may be attributed to storms and flooding that occurred during these years. The increase of leachate quantity during 2003 and 2004 is suspect and may indicate a failure in the cap/cell. In addition, chlorinated organics were detected of various concentrations. The locked fence around the Secure Cell remains intact. The visual inspection did not reveal any problems with the cap. A thick layer of grass is maintained on the cap.

Ground Water Extraction Treatment System

Because of additional source areas recently discovered and still under investigation, the remedy does not appear to be functioning as predicted. As discussed earlier in this report, under the ACL Compliance Point Monitoring Wells Data (2000-2005) Compared to Predicted Concentrations, some contaminants in some compliance wells have not met 5 years or 10 years predicted concentration levels. In most cases, the contaminant levels in the wells exhibit wide fluctuations. The remedy appears to be protective of the municipal water supply wells as containment; however, VOC sampling is only required once every three years now.

The locked fence around the extraction system has remained intact, despite the flooding that took place in 2003 and 2004.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Secure Cell (PCBs): Possible physical changes in the Secure Cell system may have occurred to explain the discrepancies stated in Question A that may have affected the protectiveness of the remedy.

Ground Water Extraction Treatment System:

Changes in Exposure Pathways

There is evidence of two new source areas impacting present remediation at the Site that may be impacting the current remedy. The physical Site conditions have changed (i.e., new sources identified). The rate and extent of these new source areas have not been defined. All potential degradation products and PCBs should be quantified. In addition, 1,4-Dioxane, a newly emerged contaminant and additive to chlorinated solvents, can now be reliably quantified in the laboratory. This constituent was not a contaminant of concern at the time of the Consent Order.

Vapor intrusion represents another possible exposure pathway that has not been investigated.

Changes in Toxicity and Other Contaminant Characteristics

Based on recent scientific data, U.S. EPA is revising the TCE toxicity values. When the TCE values are finalized, it may affect the calculated TCE ACL level.

Changes in Risk Assessment Methods

Standardized risk assessment methodologies were not used at the time of the Consent Order. Although most of the on-site ACLs were developed from a risk base standard, the risk assessment presented in the historical documents did not use current human health and ecological risk methodologies and evaluations.

Expected Progress Towards Meeting RAOs

Since the remedy was not designed to remediate source areas and, as the data suggest, cannot reduce the contaminant levels as predicted, it is not expected that the extraction system will decrease the contaminant levels in the future.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Secure Cell (PCBs): Flooding occurred during 2003 and 2004, which may have impacted the Secure Cell.

Ground Water Extraction Treatment System: The extent of two new source areas is still under investigation. New residential wells continue to be installed where city water lines

are not available. The well locations may be located in the potentially impacted area.

Institutional Controls: No institutional controls have been implemented at the Site.

Technical Assessment Summary

Secure Cell (PCBs): Flooding or cap failure may have caused the increase of leachate during 2003 and 2004. It is unknown why PCBs were detected in a monitoring well in the 2000 Report.

Ground Water Extraction Treatment System: The remedy as containment and protection for the municipal water supply wells appears to be effective. It is unknown if the remedy is protective for the residential wells in the potentially impacted area, since the wells are not routinely tested. The remedy was designed to lower the contaminant levels over time to predicted levels. A recent TRW investigation has identified two new source areas, which the remedy was not designed to remediate. Vapor intrusion pathway has not been investigated; 1,4-Dioxane has not been included in the contaminant parameter list. The current standardized risk assessment methodologies were not used at the Site; although a "risk assessment" was used to develop ACL levels. TCE toxicity values may affect the TCE ACL.

VIII. ISSUES

Secure Cell (PCBs): Flooding or possible cap failure may have affected the Secure Cell.

Ground Water Extraction Treatment System: Two new source areas have been identified. Rate and extent of contamination has not been defined.

Institutional Controls: Institutional Controls have not been implemented at the Site.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The following are the required and suggested improvements to current site operations, activities, remedy, or conditions that affect current and/or future protectiveness in narrative form. Table 14, immediately following, summaries the recommendations and follow-up actions in table form.

Institutional Controls

The original remedies did not include institutional controls for the TRW facility or impacted areas. Within six months of the date of this Five-Year Review, an interim institutional

control plan should be developed for the Site to reduce exposure to contaminants while further investigation is undertaken. This interim institutional control plan should be implemented within one year of this Five-Year Review.

Secure Cell (PCBs)

The increase of leachate quantity during 2003 and 2004 is suspect. The integrity of the cap should be investigated by TRW. Cap/cell failure may affect current and future protectiveness.

Ground water elevations should be measured for monitoring wells 13 and 20. Ground water flow maps should be included in each report. Monitoring wells MW-13, MW-19A, and MW-20 should be sampled for PCBs. The analytical method, Method Detection Limit (MDL), and background levels should be included in each report. A map identifying the locations of the Secure Cell, main buildings (PCC Airfoils), leachate tank, lysimeters, identified monitoring wells, etc., should be included in each report. The lysimeters should be evaluated for future use. These recommendations should not affect the current or future protectiveness.

Methylene chloride was detected in various samples in many of the reports and is a common laboratory contaminant. Dibromochloromethane and some other compounds were also detected at low levels. The reports should evaluate the detection of these constituent and, if data suggests, indicate a possible source (i.e., laboratory contaminant). This should not affect the current or future protectiveness.

Non-compliance issues with the TSCA permit and Consent Order should be addressed and resolved. The permit and Consent Order should be re-evaluated.

Ground Water Extraction Treatment System

<u>New Source Areas</u>

The rate and extent of the new source areas should be identified and investigated. Potential affects on the residential wells, municipal water wells, vapor intrusion, ground water model, recovery wells, monitoring wells, ACLs, etc., should also be evaluated.

<u>Residential Wells</u>

Residential wells, identified by TRW in the potentially impacted area, appear to fall into three categories: (1) the well exists, but not used for any purpose, (2) well used for other purposes except drinking, and (3) well used for potable water supply. Some residents in

the potentially impacted area did not respond to the survey. The wells that are not used should be correctly abandoned. Wells used for other purposes and wells used for potable water should be tested on a routine basis and have back flow preventers installed. Back flow preventers are designed to prevent cross contamination. The Stark County Health Dept., TRW Project Manager, and Ohio EPA are currently discussing these issues, which are still unresolved. The Stark County Health Dept. has jurisdiction over residential wells.

According to the Stark County Health Dept., no new residential wells can be installed if an existing municipal waterline and hookup exists next to the property. Conversely, residential wells can be installed where no municipal waterline or hookup exists. Stark County Health Dept., TRW Minerva Project Manager, and Ohio EPA are evaluating this area and comparing it to the potentially impacted area.

VOC testing on residential wells is not conducted on a routine basis; the last testing was conducted in 1996. As specified in this report, under "Second Five-Year Review (2000) Summary," there were several detected VOCs. One well was above the MCL for vinyl chloride; however, the well was used at that time for secondary purposes.

Interim institutional controls need to be identified and implemented to reduce possible exposure to contaminants in well water. This may include enactment of local ordinances regarding well use, well closure, and a communication plan for residential well users. This may also include proprietary controls to reduce exposure.

The two new identified source areas that are currently under investigation for defining the extent of contamination and the requested sampling for 1,4-Dioxane may also affect the protectiveness of the residential wells. The residential well issues affect the current and future protectiveness.

Village of Minerva's Municipal Wells

The Village is only required to sample VOCs once every three years. Water quality in the village's municipal wells should be monitored on a routine basis by TRW. The raw water before treatment should be sampled. TRW should conduct this sampling.

Vapor Intrusion

Property assessment of potential impacts to indoor air from soil and/or ground water contaminated with VOCs has become a significant issue in the evaluation of environmental and health impacts at sites based on an evolving understanding of soil vapor migration and intrusion. As a result, TRW Minerva should be evaluated to determine if this site has the potential for exposures related to soil vapor intrusion. The Site should be evaluated to

determine whether the vapor intrusion pathway is complete. If it is determined to have a complete pathway, further evaluation is necessary to determine whether the pathway poses a potentially significant risk to human health and whether interim or long-term mitigation or remedial measures are necessary. Further consideration of the vapor intrusion pathway must be considered if future plans for the Site include development that could result in a complete exposure pathway.

Ground Water Monitoring Wells/Recovery Wells/Compliance Point Wells

The ground water monitoring and recovery well system should be re-evaluated once the rate and extent of ground water contamination is defined. The ACL compliance point well locations should also be evaluated. At that time, a comprehensive sampling of all monitoring wells should be discussed. Until then, the current monitoring system and recovery wells should be maintained including, but not limited to, locking, bumper guards (if needed), repairing aprons, installing identifying numbers on all wells (including recovery wells), etc. TRW is responsible for conducting this work. The above affects the current and future protectiveness.

Degradation Products

All degradation products (as well as any other VOC detected) should be evaluated and reported. This may affect the current and future protectiveness.

ACLs/Risk Assessment/Toxicity Issues

The MCLS were based on very early risk methodologies, which may affect the current and future protectiveness. An updated human health and ecological risk assessment should be conducted.

Monitoring Well 13 and 13B

This issue is still unresolved. Monitoring well 13 is specified as one of the compliance point wells; however, this well is usually dry. When well 13 is dry, TRW has been substituting monitoring well 13B in it's place for sampling. The ground water monitoring wells 13 and 13B are in close proximity to each other and similar in depth. In order to provide accurate trend data, the Work Plan in the Subsurface Order should be changed to make well 13B one of the compliance point wells. Well 13 should be used for static water level measurements (when not dry) and in the event of the GET shutdown, could be used for sampling. This probably does not affect the current or future protectiveness.

Laboratory Dilution Factor

Ohio EPA does not know if this item has been addressed from the 2000 Review. The laboratory should note the dilution factor on the bottom of the analytical data sheets and, in turn, this should be included on all raw data, summary lab sheets, etc., to Ohio EPA and the Minerva repository file. This probably does not affect the current or future protectiveness.

Future Remedy Selection

Once additional investigations and necessary risk assessments have been completed, the remedy selection process should be utilized to determine what additional remedial actions need to be taken, including what final institutional controls are required and the extent of the area subject to institutional controls.

Table 14 - Recommendations and Follow-Up Actions - Summary

Issue	Recommendations /Follow-Up Actions	RP*	Over-sight Agency	Mile-stone Date	Affects Current Protect-iveness (Y/N)	Affects Future Protect-iveness (Y/N)
ICs	Within 6 months, an interim institutional control plan should be developed, Res. wells: This may include enactment of local ordinances regarding well use, well closure and communication plan.	TRW	Ohio EPA	3/21/06	Y	Y

ICs	Implement IC control plan within one year of this Five Year Review. Res wells: This may include enactment of local ordinances regarding well use, well closure and communication plan for res well users.	TRW	Ohio EPA	9/21/06	Y	Y
Secure Cell (PCBs) increase of leachate	Investigate-verify cap integrity	TRW	Ohio EPA		Y	Y
Secure Cell (PCBs) Misc. require-ments	To include in annual Report: Measure GW elevations for MW 13 and 20; provide flow maps; sample MW-13, MW-19A, and MW-20 for PCBs; provide the analytical method, MDL, and background levels; map identifying locations of cell, buildings, leachate tank, lysimeters, MWs, etc.	TRW	Ohio EPA	next report	N	N
Secure Cell (PCBs) lysimeters	Evaluate lysimeters for future use.	TRW	Ohio EPA		N	N

Secure Cell (PCBs) Methylene chloride and others	Evaluate methylene chloride, dibromochloro-methane and other compounds detected at low levels (lab contaminant?)	TRW	Ohio EPA	all future sampl-ing	N (?)	N (?)
Secure Cell (PCBs) Non-compliance issues with TSCA permit and Consent Order	These issues should be resolved. Permit and Consent Order should be re-evaluated	TRW, Ohio EPA, U.S. EPA		2006	N (?)	N (?)
GW Order-New source areas	Define rate and extent-affects on res. wells, municipal wells, vapor intrusion, GW model, recover wells (P&T), MWs, MCLS, etc.	TRW	Ohio EPA	on-going	Y (?)	Y (?)

GW Order-Res. wells	Resolve res. will issues including authority, sampling, sampling frequency, connecting to municipal water lines, abandonment, installation of backflow preventers, define potentially impacted area (including installation of new wells), etc.	TRW, Ohio EPA, SCHD		on-going	Y	Y
GW Order-1,4-Dioxane	Add 1,4-Dioxane to contaminant parameter list	TRW	Ohio EPA	all future sampl-ing	?	?
GW Order-Non-responders to res. well survey	Verify well and well use	SCHD	Ohio EPA		?	?
GW Order-Municipal wells	Sample municipal water wells - raw water - yearly basis	TRW	Ohio EPA, Village of Minerva	yearly-2005	Y (?)	Y (?)
GW Order-Vapor intrusion	Evaluate vapor intrusion, define potentially impacted area first	TRW	Ohio EPA		Y	Y

GW Order-MWs, recovery wells, compliance point wells and GW model - after rate and extent of new source areas defined.	Re-evaluate MWs and recovery wells and compliance point wells and GW model after rate and extent of new source areas are defined.	TRW	Ohio EPA		Y (?)	Y (?)
GW Order-MW system	Maintain all monitoring wells (locked, repair cracked aprons, etc.)	TRW	Ohio EPA		Y	Y
GW Order-Degrad-ation products and other detected VOCs	Evaluate and include in reports.	TRW	Ohio EPA	all future sampl-ing	Y	Y
GW Order-ACLs, Risk Assess-ment, toxicity Issues	Conduct HH and ecological risk assessments according to current methodologies. Evaluate ACLs.	TRW	Ohio EPA		Y	Y

GW Order-MW 13 and 13B	Resolve sampling of issue of MW 13, and MW 13B. For accurate trend data, change Work Plan in Subsurface Order to make MW 13B a compliance point well. Use MW 13 for static water levels when not dry.	TRW	Ohio EPA		N	N
GW Order-Lab dilution factor	Lab should note dilution factor on bottom of analytical data sheets /TRW should include information in all reports.	TRW	Ohio EPA		N	N
GW Order-Future remedy selection	After additional investigations and new risk assessments are completed, remedy selection should be evaluated and determined, including what final institutional controls are required and the extent of the area subject to institutional controls.	TRW	Ohio EPA, SCHD?		Y	Y

* RP = Responsible Party

X. PROTECTIVENESS STATEMENTS

Secure Cell (PCBs)

The U.S. EPA has indicated that there are non-compliance issues (i.e., lysimeters, etc.) with the TSCA permit regulations. The ground water monitoring wells surrounding the Secure Cell have not indicated an impact to the environment. Compliance issues and investigations need to be completed.

The remedy for the PCB contamination on-site is considered protective in the short-term; however, in order for this part of the remedy to be protective in the long term, follow-up actions need to be taken, including implementation of institutional controls.

Ground Water Extraction Treatment System

A protectiveness determination of the remedy at TRW Minerva cannot be made, at this time, until further information is obtained. The goal of the remedy, decreasing contaminants over time to predicted levels, has not been met. Further information will be obtained by defining the rate and extent of the newly identified source areas; remediating these source areas; evaluating the ground water extraction treatment system (and recovery wells) as a remedy; evaluating the ground water monitoring system; evaluating ACL locations; re-calculating ACL numbers using current human health and ecological risk assessment methodologies and guidance; sampling for 1,4-Dioxane and evaluating all degradation products; evaluating for vapor intrusion; and addressing all issues regarding residential wells.

(A) Residential wells: The remedy is not protective unless follow-up actions are taken to ensure protectiveness. Routine sampling should be conducted on the residential wells or the wells should be abandoned. Interim institutional controls need to be identified and implemented to reduce possible exposure to contaminants in well water. This may include enactment of local ordinances regarding well use and well closure.

(B) Municipal water supply wells: Although the compliance point wells monitor the level of contaminants on a continuing basis and the remedy as containment appears to be working, the Village is only required to conduct VOCs sampling once every three years. Even though no VOCs were detected in the 2001 and 2004 analytical results, the sampling frequency for VOCs is not sufficient to determine a level of protectiveness; therefore, a protectiveness determination cannot be made at this time.

Long Term Protectiveness

Long term protectiveness cannot be evaluated until all of the above have been addressed.

As a protectiveness determination of the remedies cannot be made until the recommended actions discussed above are taken, the protectiveness of the remedies will need to be reconsidered within a year of the date of this Five-Year Review. At that time, progress toward completing the recommended actions will be evaluated. This will be made through a Five-Year Review Addendum.

Other Comments

In the event the GET system is turned off, preventive measures should be implement to protect all receptors that include the Village of Minerva's water supply and residential wells.

XI. NEXT REVIEW

The next (Fourth) Five-Year Review for the TRW Minerva Site is required by September 21, 2010, five years from the date of this review. A protectiveness determination of the remedies through a Five-Year Review Addendum is due within a year of the date of this Five-Year Review.

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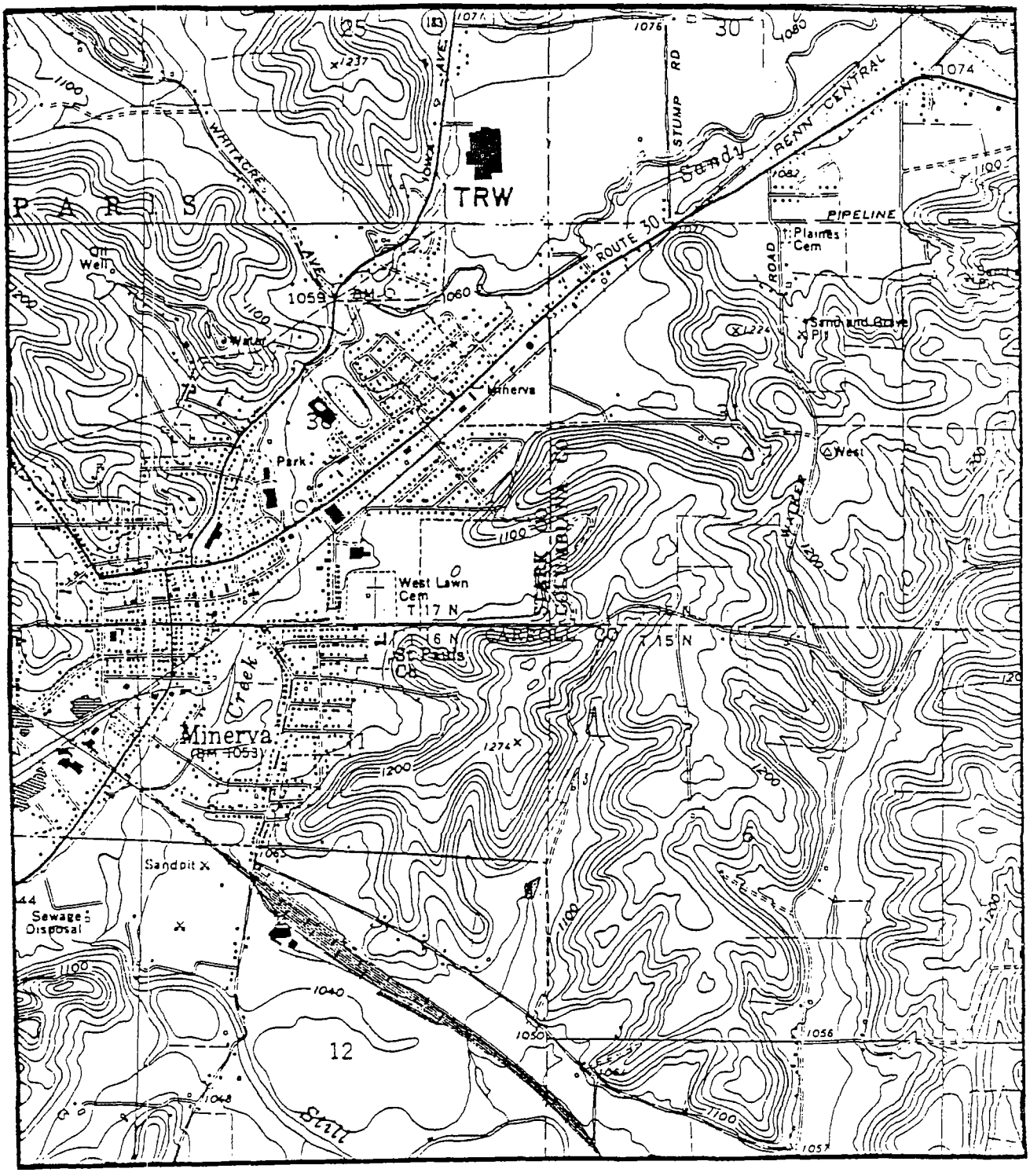
FIGURES

FIGURE 1

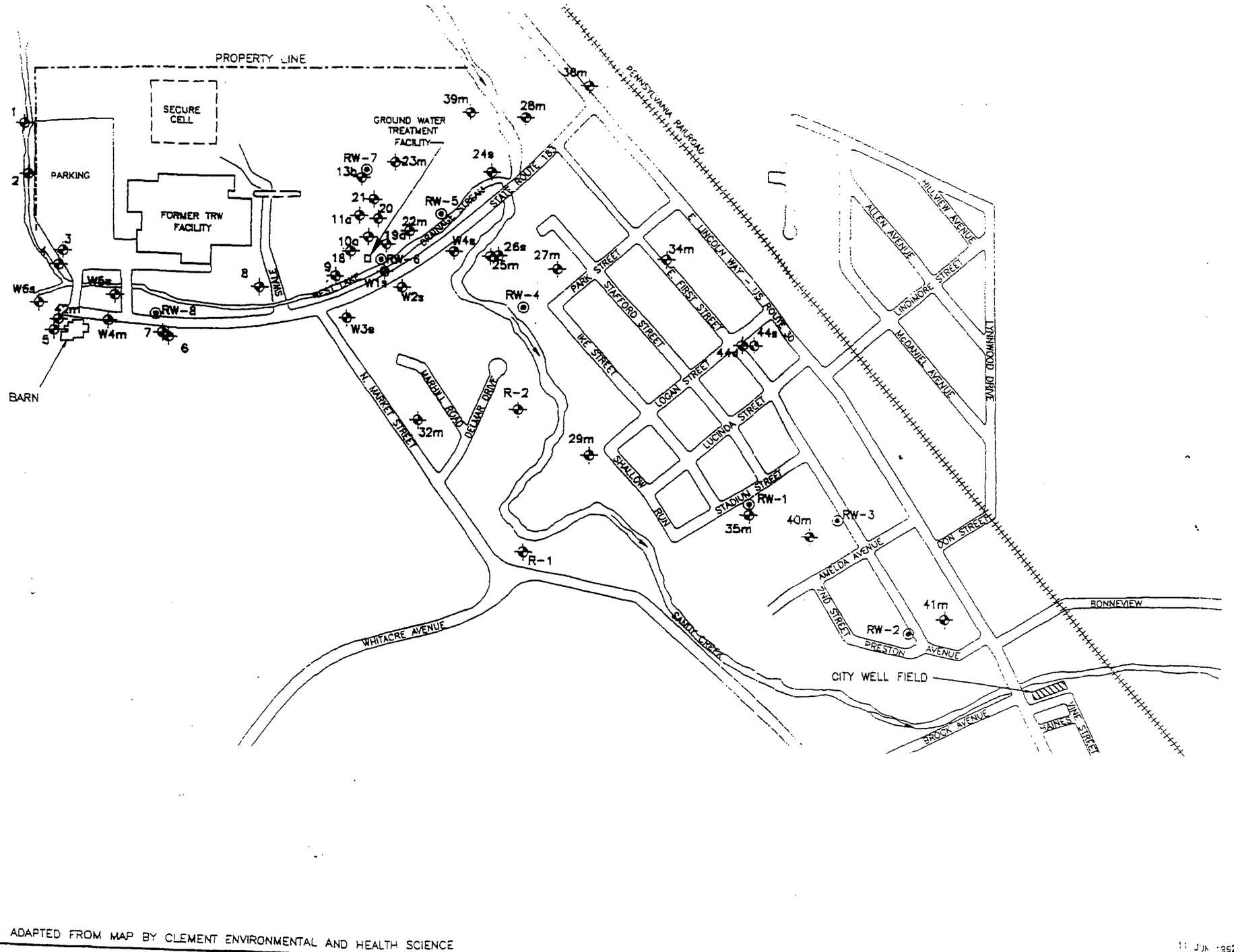
Location of the TRW Site, Minerva, Ohio



(From Clement Associates, Inc., April 1985)

FIGURE 2

TRW INC.
MINERVA, OHIO



ADAPTED FROM MAP BY CLEMENT ENVIRONMENTAL AND HEALTH SCIENCE

11 JUN 1992

LEGEND

- MONITORING WELL LOCATION
- RECOVERY WELL LOCATION

SITE MAP

600 0 600

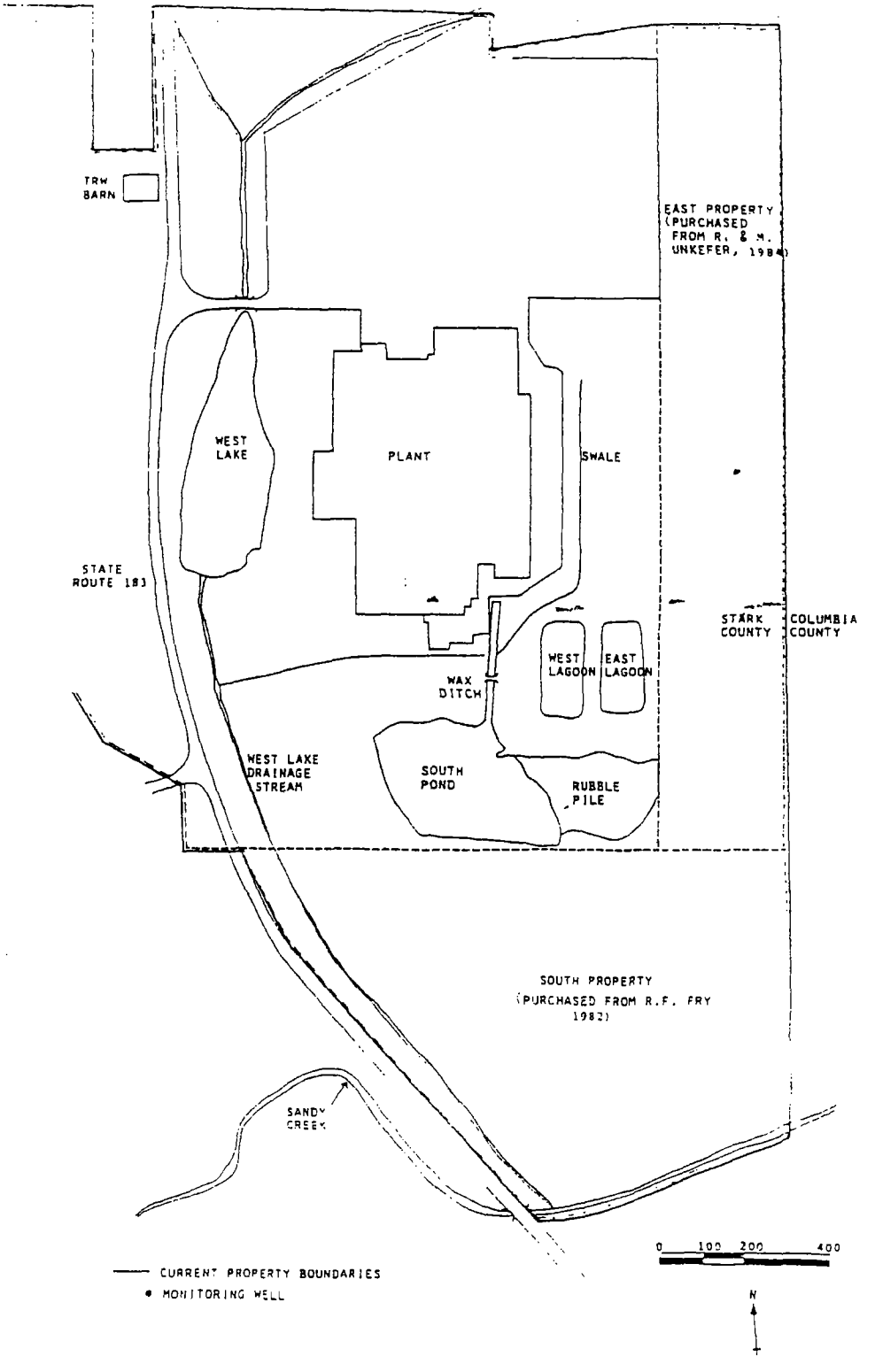
SCALE IN FEET

2795.213.320

(From O'Brien & Gere, June, 1992)

FIGURE 3

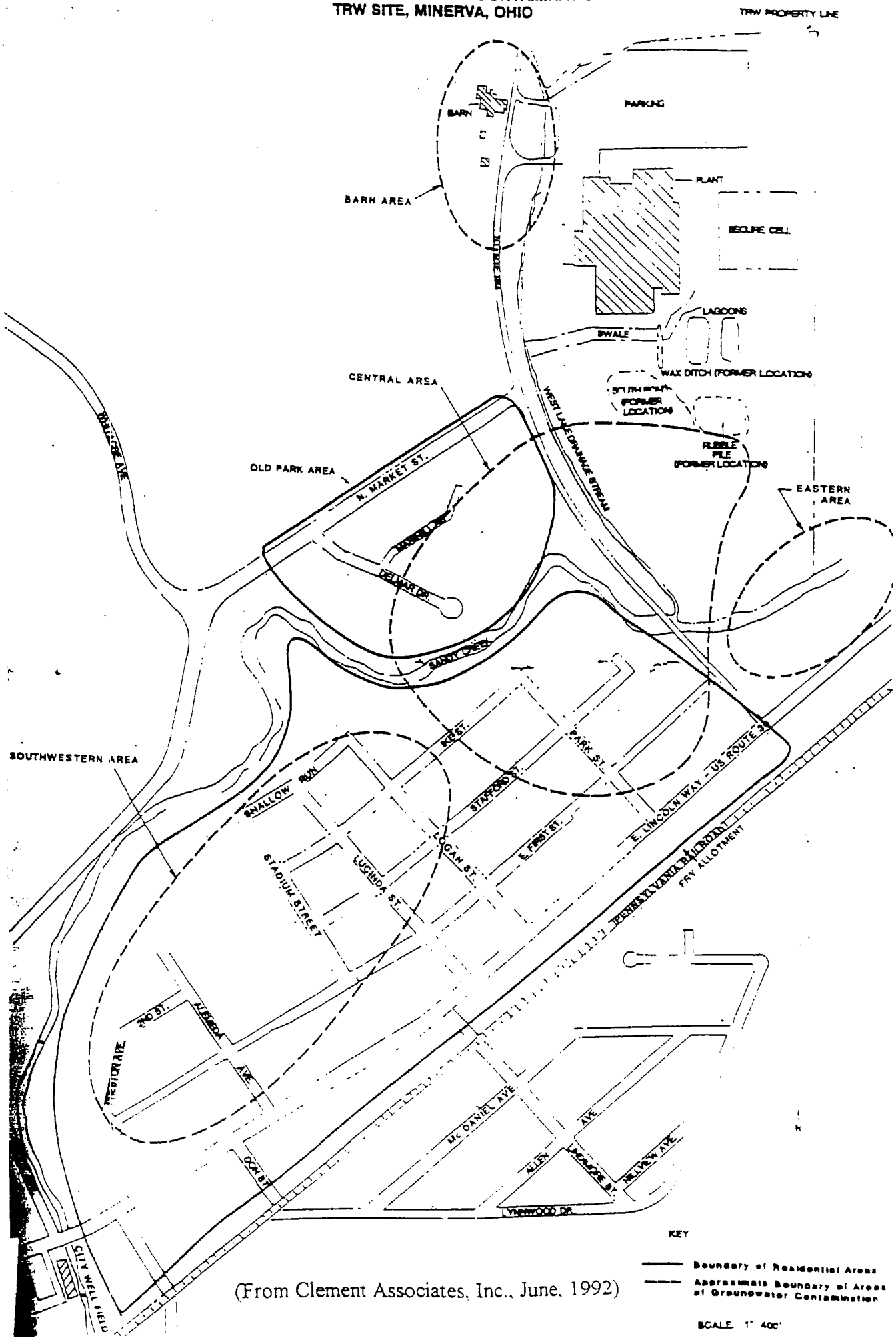
SITE PLAN AND BOUNDARIES OF THE TRW PROPERTY
MINERVA, OHIO



(From Clement Associates, Inc., April, 1985)

FIGURE 4

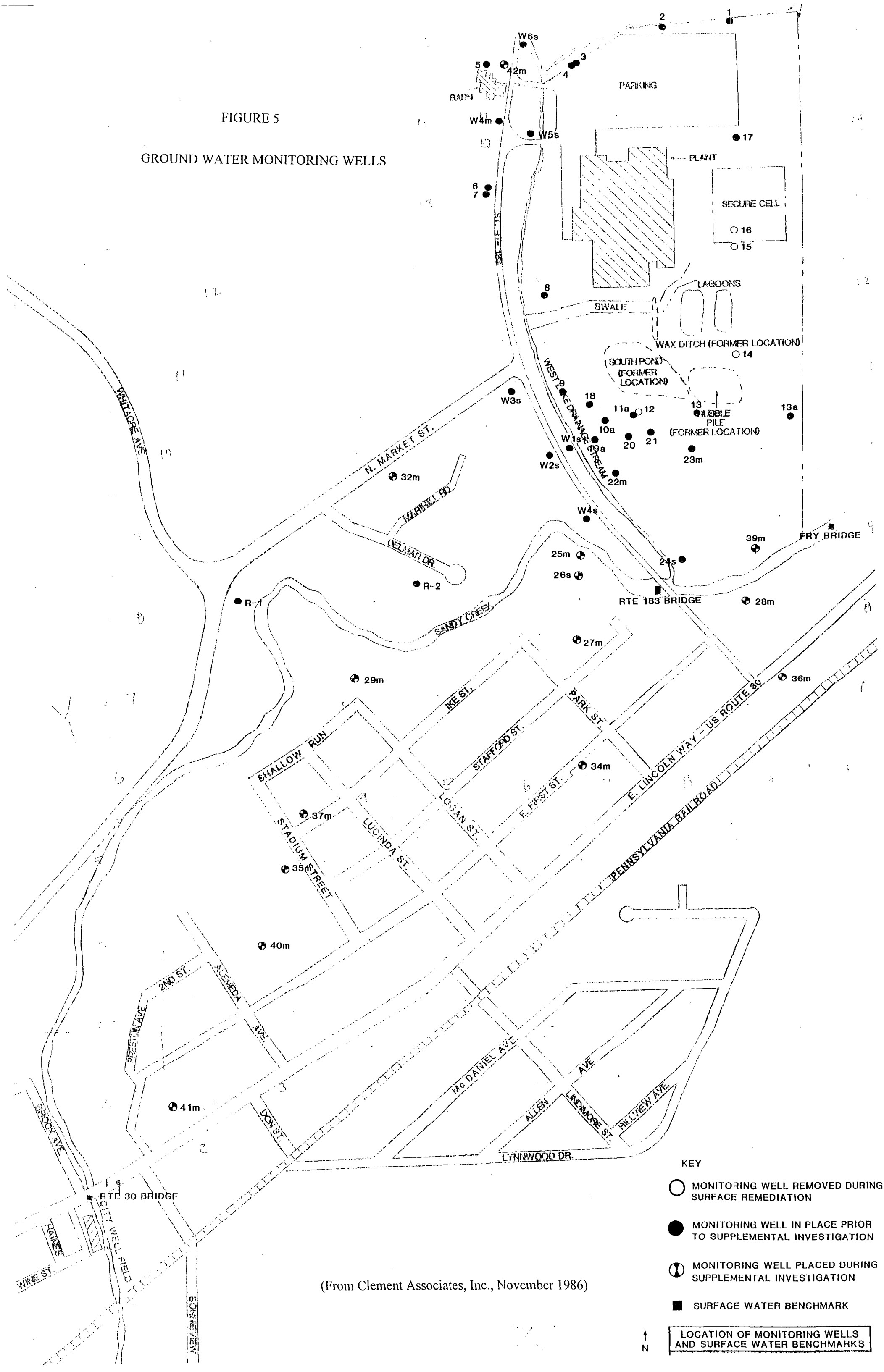
EXTENT OF GROUNDWATER CONTAMINATION
TRW SITE, MINERVA, OHIO



(From Clement Associates, Inc., June, 1992)

FIGURE 5

GROUND WATER MONITORING WELLS



(From Clement Associates, Inc., November 1986)

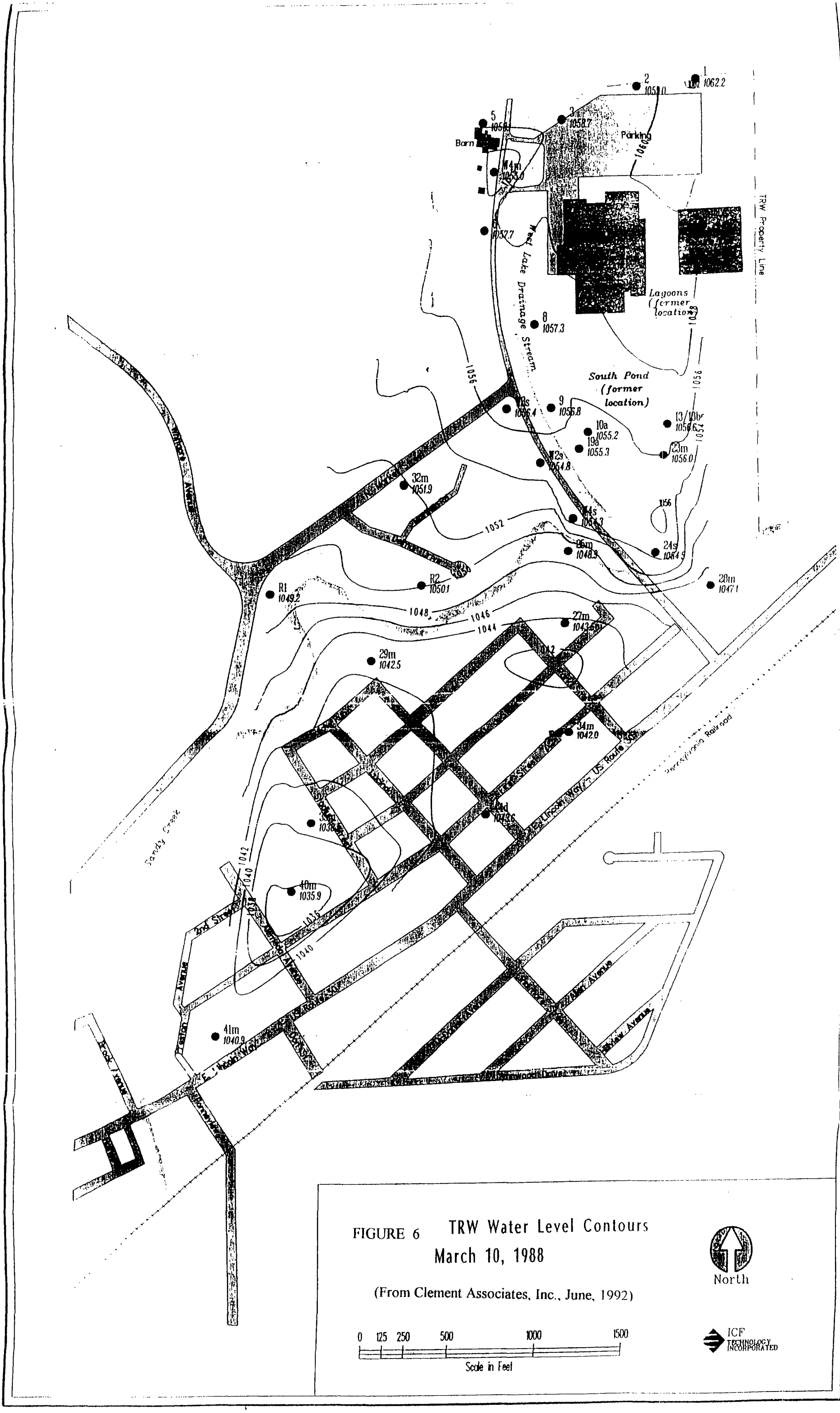


FIGURE 6 TRW Water Level Contours
March 10, 1988

(From Clement Associates, Inc., June, 1992)

North

0 125 250 500 1000 1500
Scale in Feet

ICF TECHNOLOGY INCORPORATED

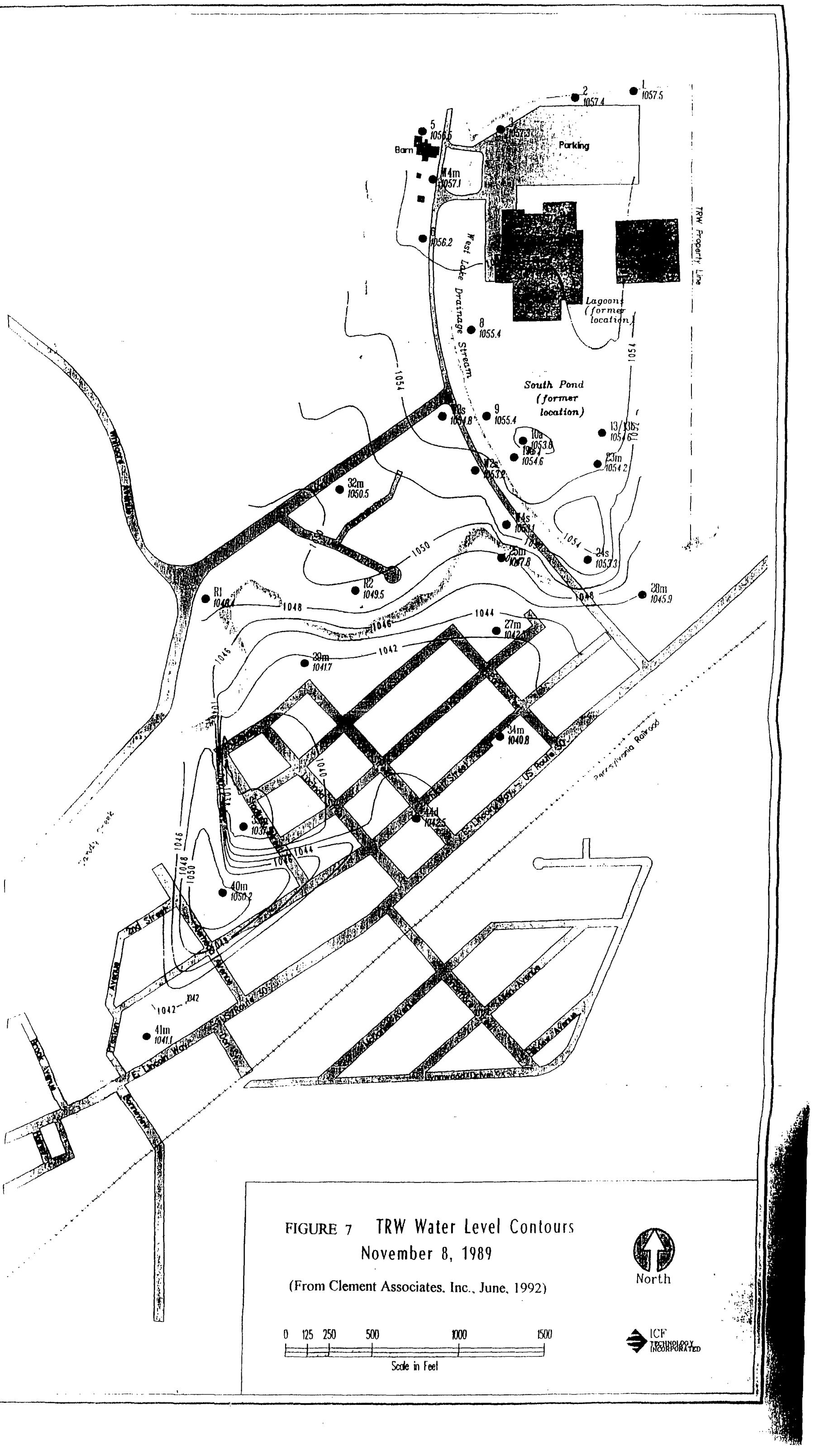


FIGURE 7 TRW Water Level Contours
November 8, 1989

(From Clement Associates, Inc., June, 1992)

North

0 125 250 500 1000 1500

Scale in Feet

ICF TECHNOLOGY INCORPORATED

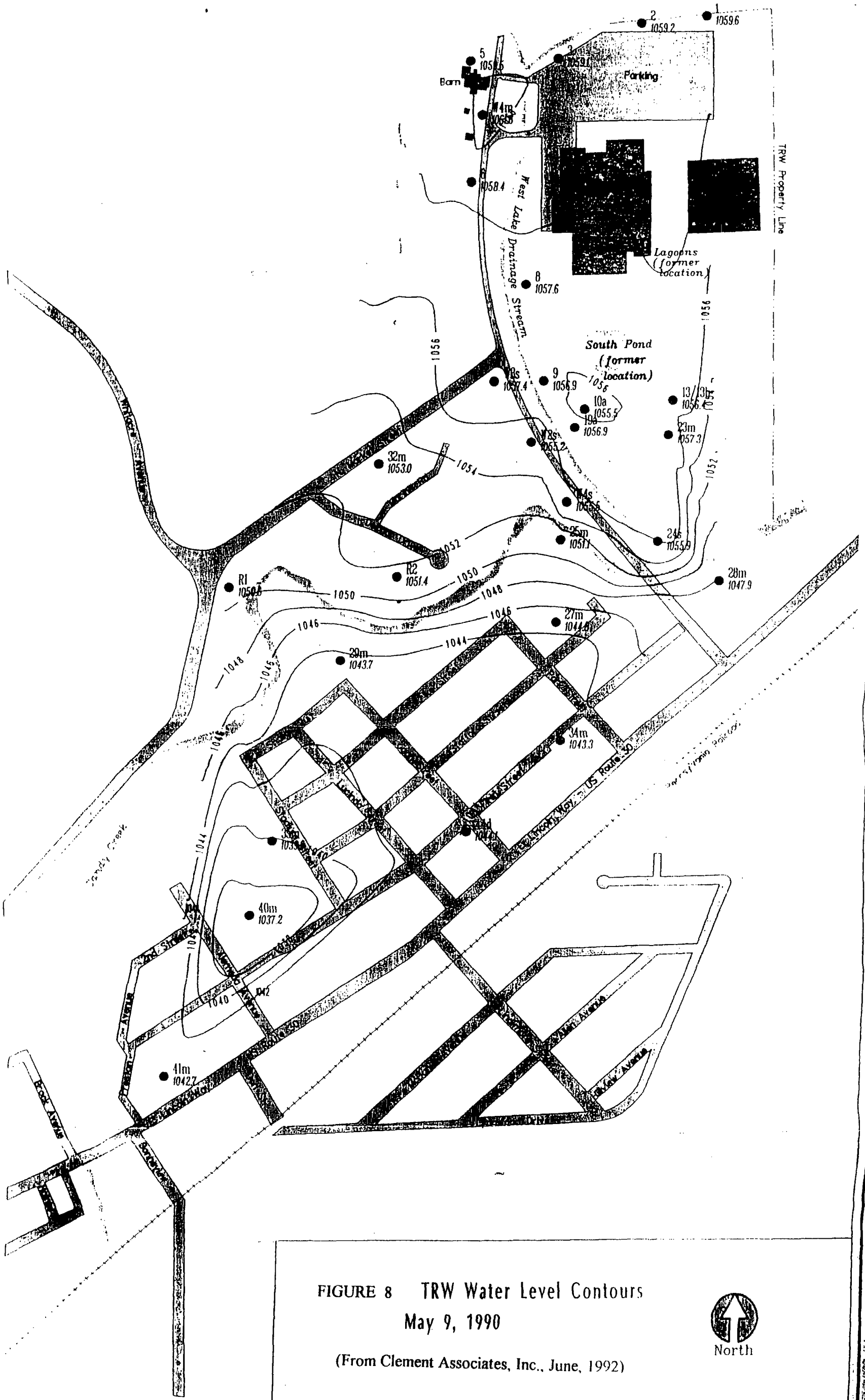


FIGURE 8 TRW Water Level Contours
May 9, 1990

(From Clement Associates, Inc., June, 1992)

North

0 125 250 500 1000 1500

Scale in Feet

ICF TECHNOLOGY INCORPORATED

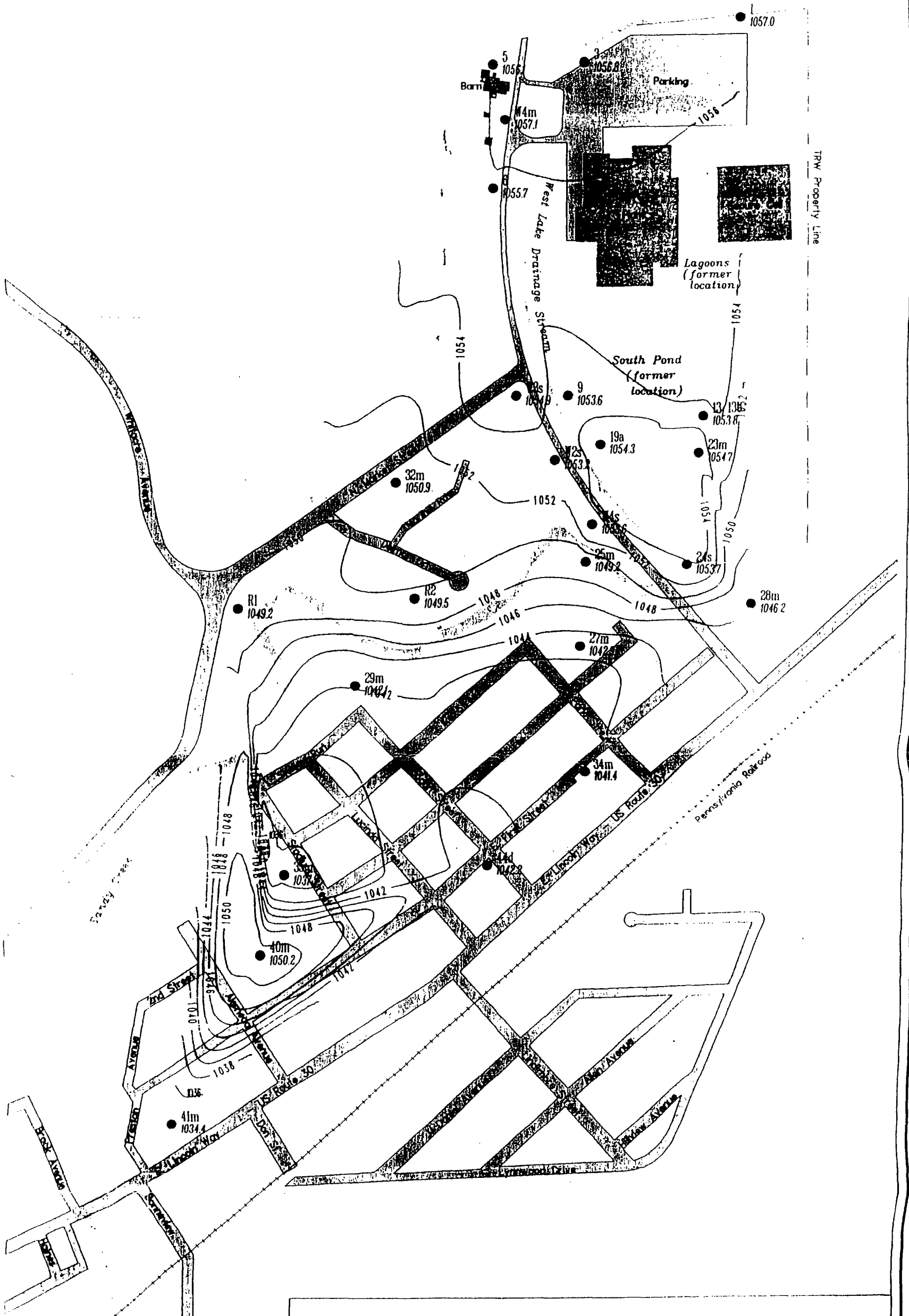


FIGURE 9 TRW Water Level Contours
August 8, 1991

(From Clement Associates, Inc., June, 1992)

North

0 125 250 500 1000 1500

Scale in Feet

ICF TECHNOLOGY INCORPORATED

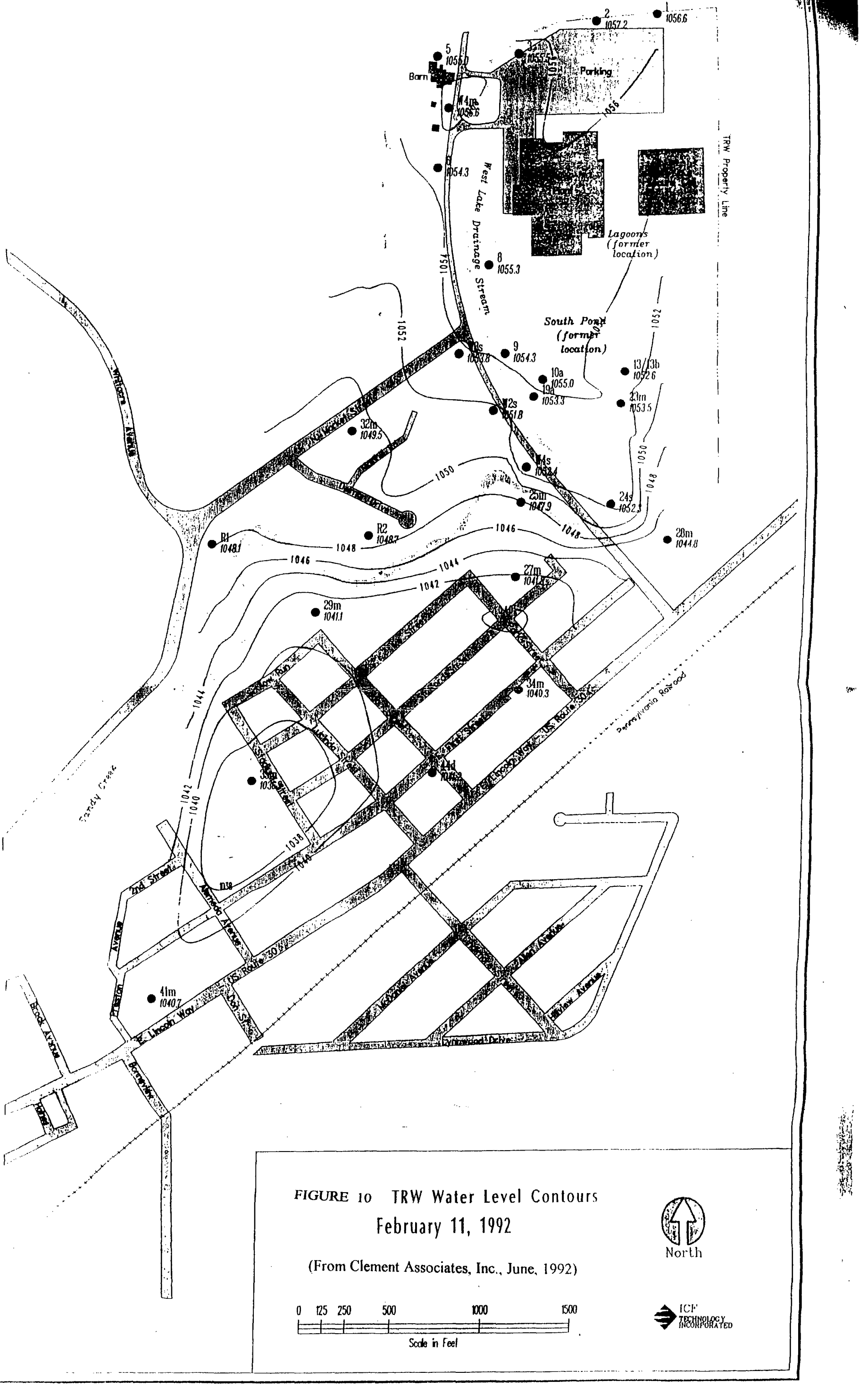


FIGURE 10 TRW Water Level Contours

February 11, 1992

(From Clement Associates, Inc., June, 1992)

North

0 125 250 500 1000 1500

Scale in Feet

ICF TECHNOLOGY INCORPORATED

Location of Residential Wells

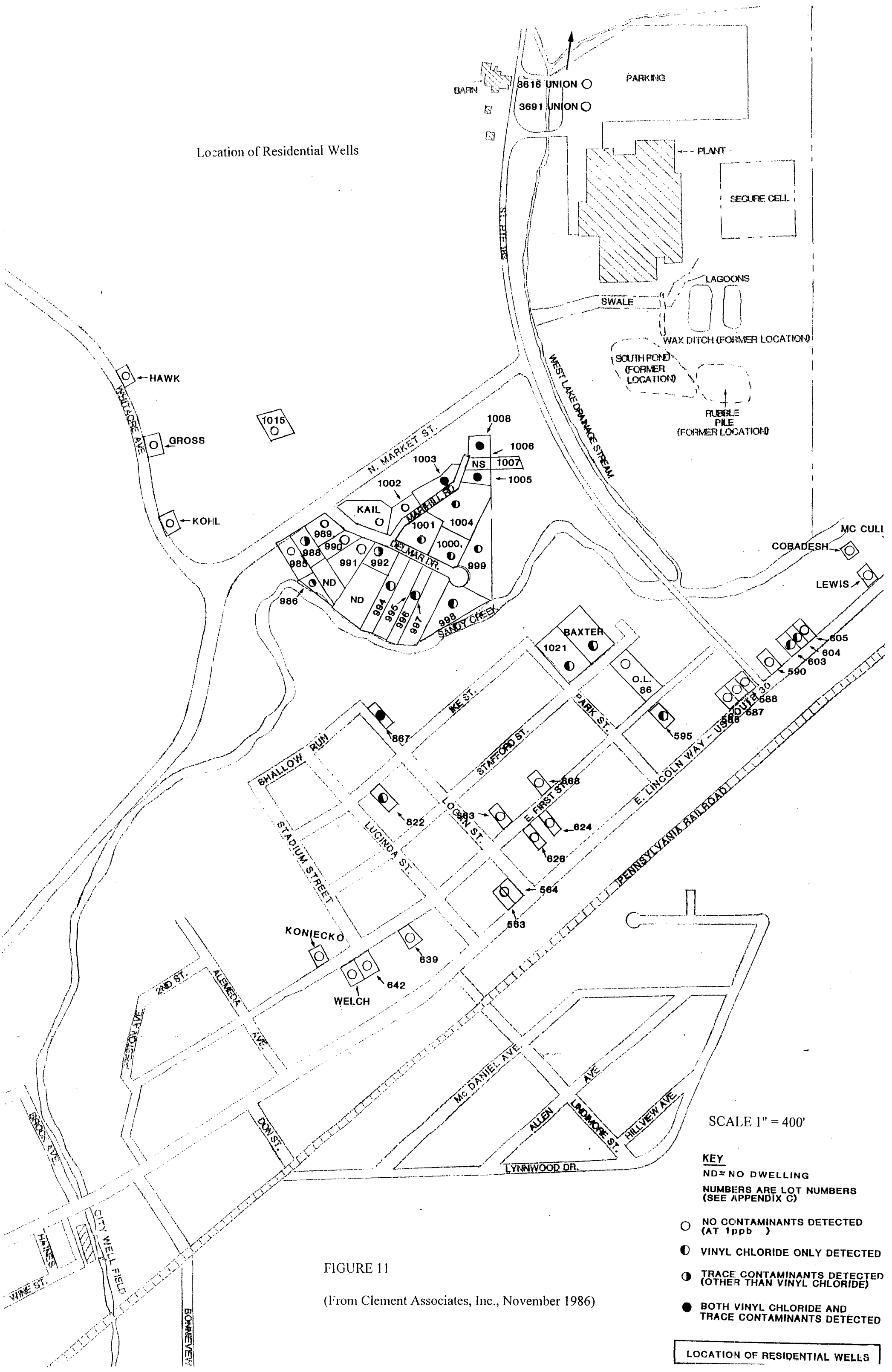


FIGURE 11

(From Clement Associates, Inc., November 1986)

SCALE 1" = 400'

KEY

ND = NO DWELLING

NUMBERS ARE LOT NUMBERS (SEE APPENDIX C)

○ NO CONTAMINANTS DETECTED (AT 1ppb)

◐ VINYL CHLORIDE ONLY DETECTED

◑ TRACE CONTAMINANTS DETECTED (OTHER THAN VINYL CHLORIDE)

● BOTH VINYL CHLORIDE AND TRACE CONTAMINANTS DETECTED

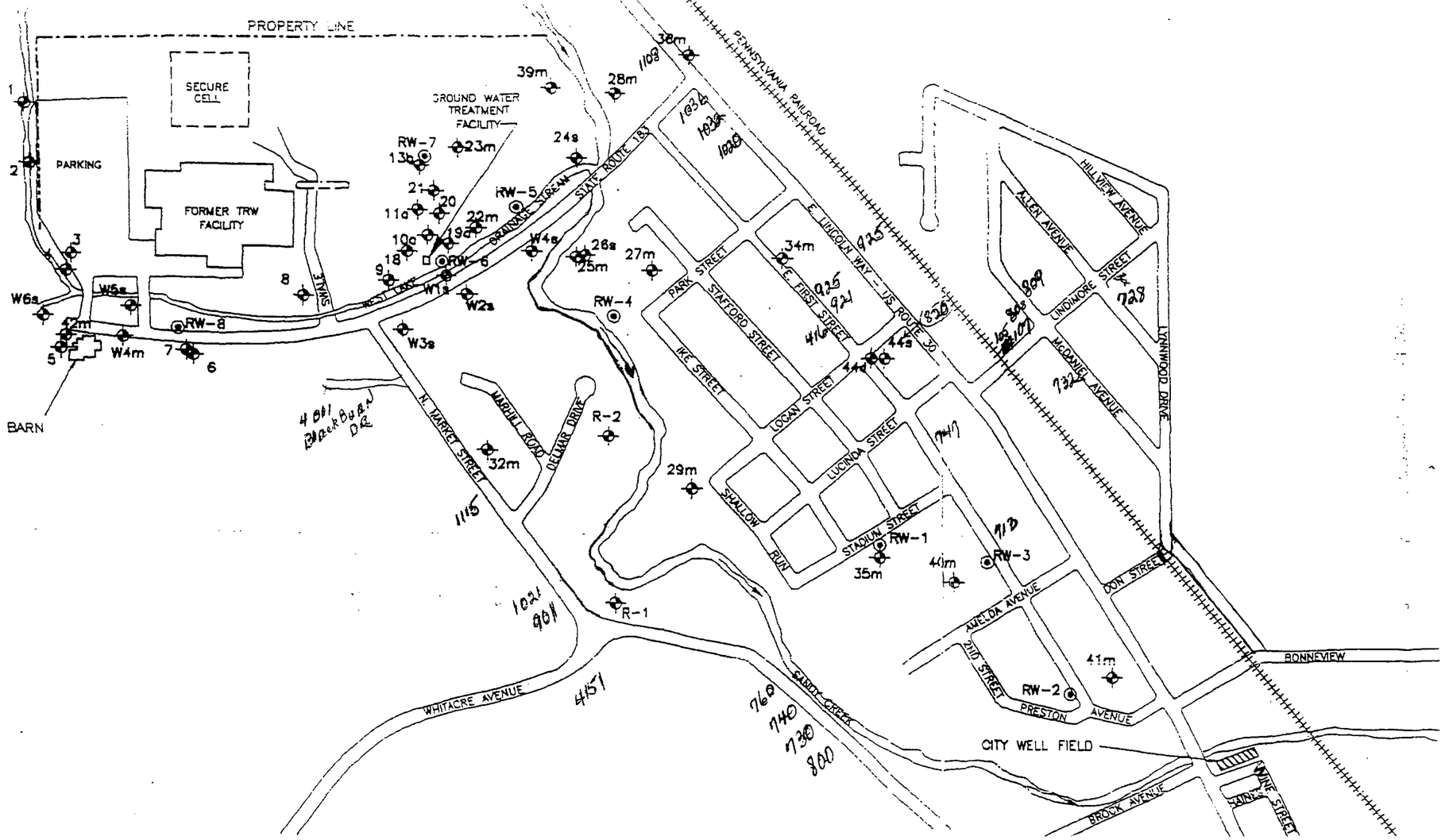
LOCATION OF RESIDENTIAL WELLS

FIGURE 12

TRW INC.
MINERVA, OHIO

1995 Five-Year Review

May 6, 1994 - Residential Well Locations



LEGEND

- ◈ MONITORING WELL LOCATION
- ⊙ RECOVERY WELL LOCATION

SITE MAP

600 0 600

SCALE IN FEET

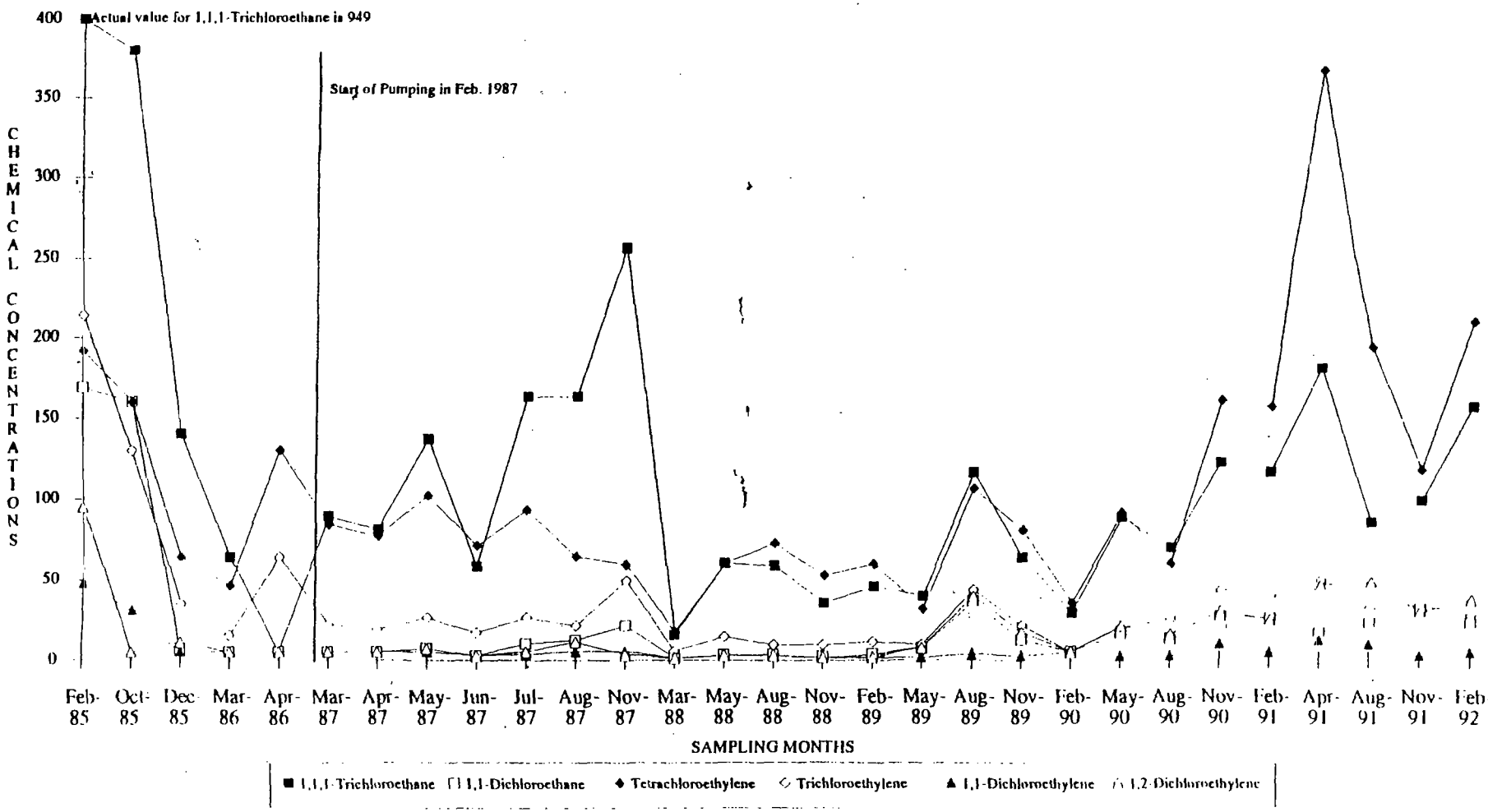
2795.213.320

(Modified from O'Brien & Gere, June, 1992)

ADAPTED FROM MAP BY CLEMENT ENVIRONMENTAL AND HEALTH SCIENCE

11 JUN 1992

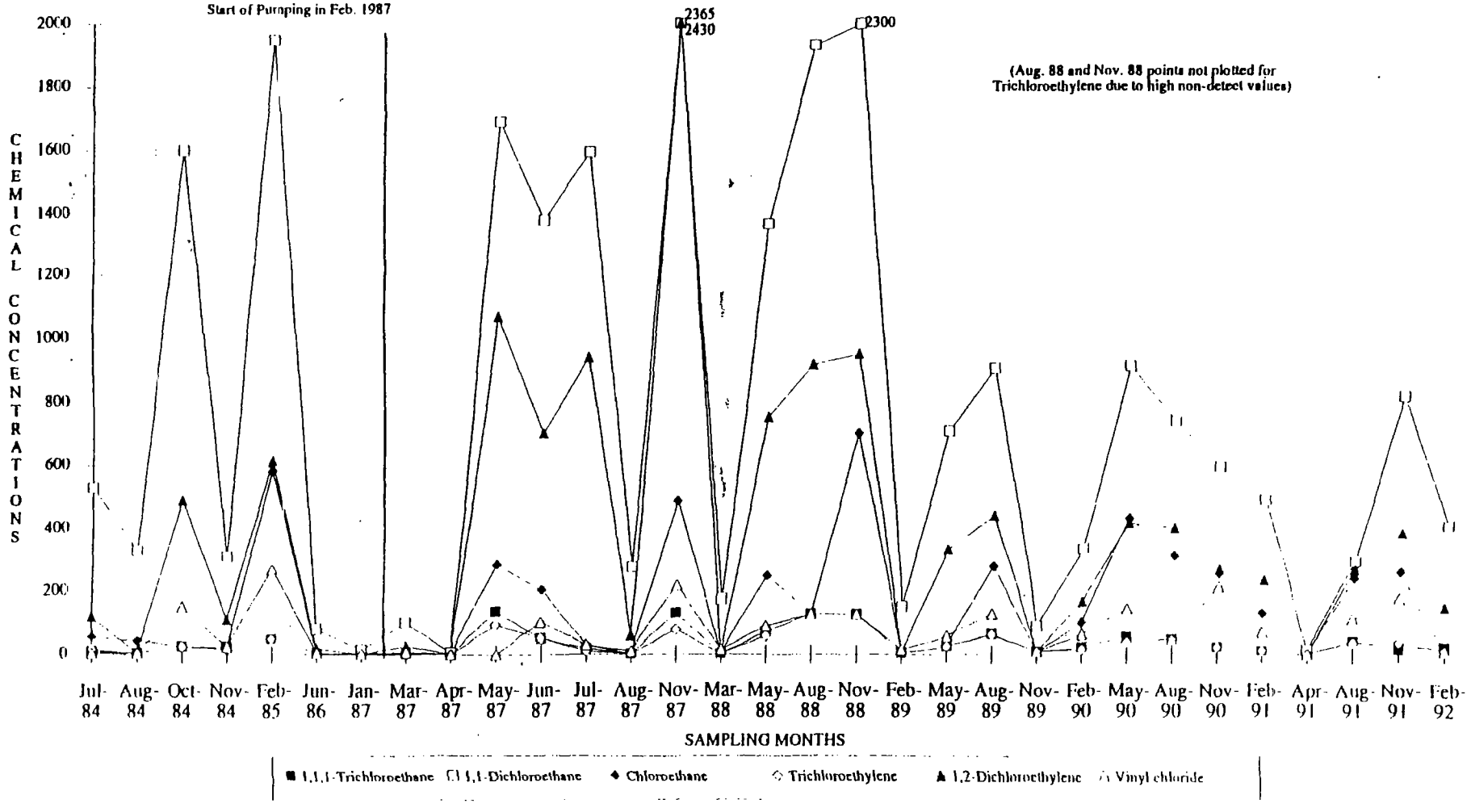
FIGURE 13
ACL Compliance Point - Well W4m



(From Clement Associates, Inc., June, 1992)

FIGURE 14

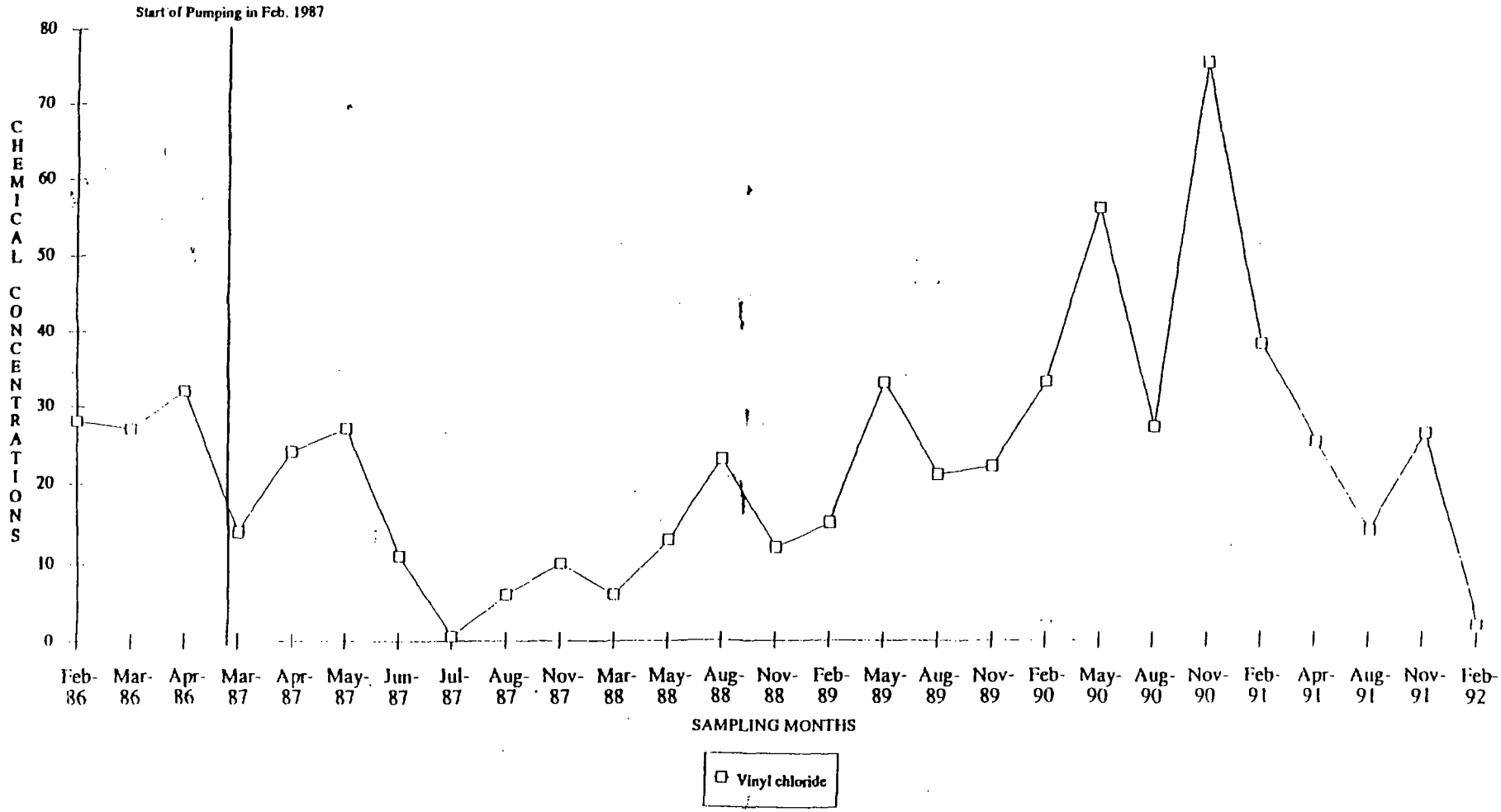
ACL Compliance Point - Well 13/13b



(From Clement Associates, Inc., June, 1992)

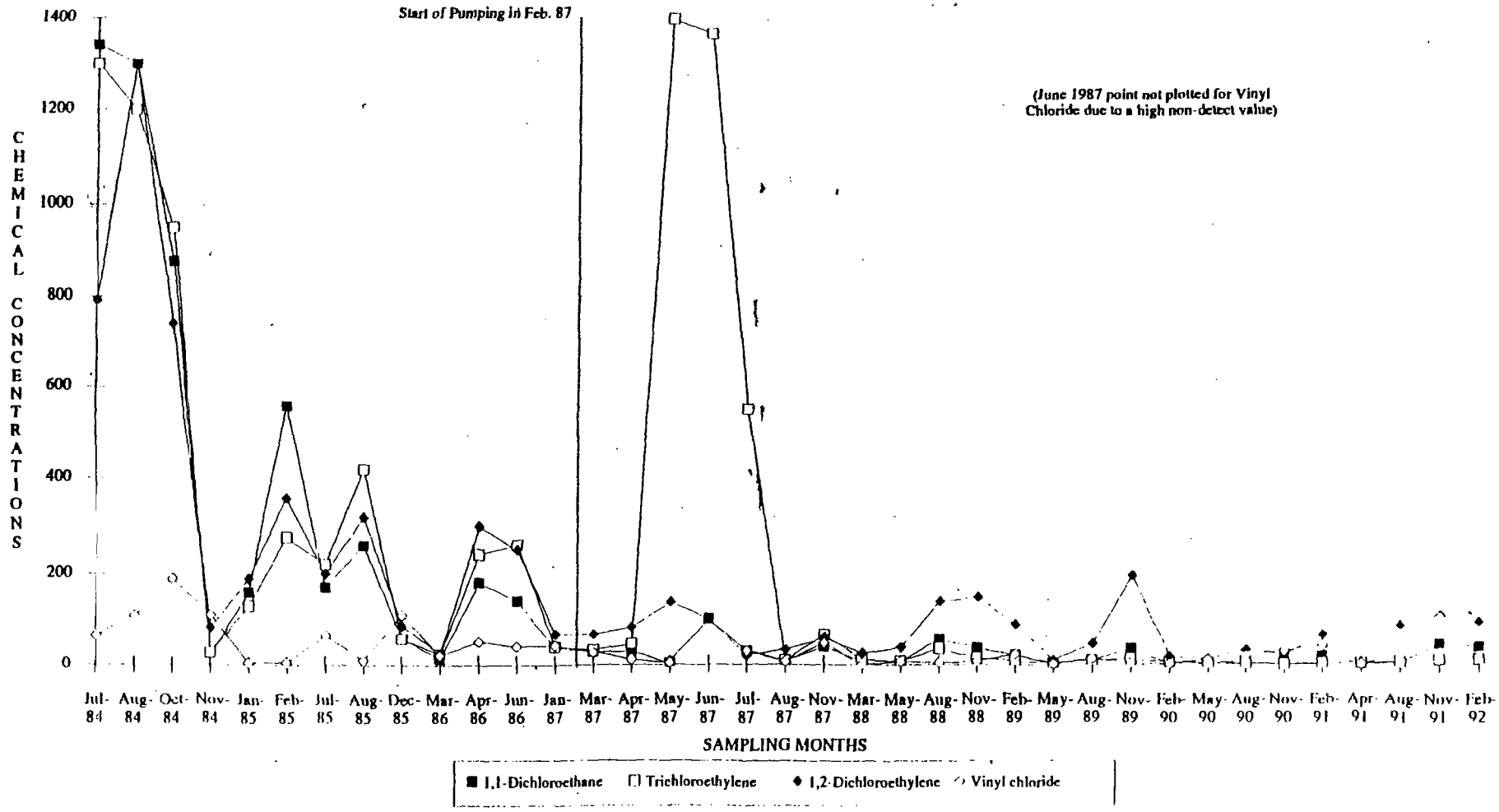
FIGURE 16

ACL Compliance Point - Well 35m



(From Clement Associates, Inc., June, 1992)

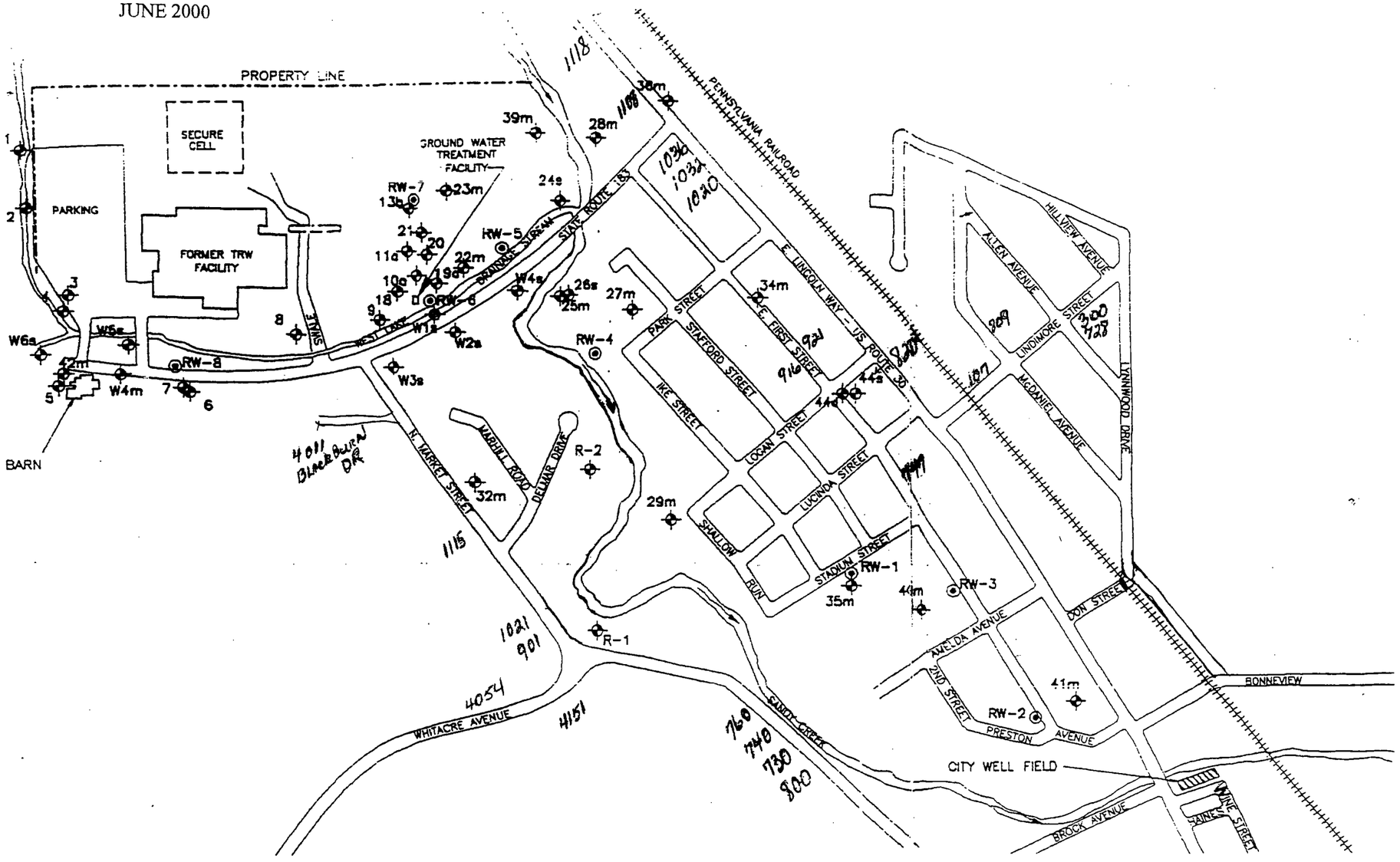
FIGURE 15
ACL Compliance Point - Well 19a



(From Clement Associates, Inc., June, 1992)

RESIDENTIAL WELL LOCATIONS

JUNE 2000



ADAPTED FROM MAP BY CLEMENT ENVIRONMENTAL AND HEALTH SCIENCE

11 JUN 1992

FIGURE 17

TRW INC.
MINERVA, OHIO

RESIDENTIAL WELL LOCATIONS
JUNE 2000

LEGEND

- MONITORING WELL LOCATION
- RECOVERY WELL LOCATION

WRITTEN NUMBERS IDENTIFY THE ADDRESSES AND LOCATIONS OF RESIDENTIAL WELLS

SITE MAP

600 0 600

SCALE IN FEET

2795.213.320

(Modified from O'Brien & Gere, June, 1992)

(From Camp Dresser & McKee, 2000)

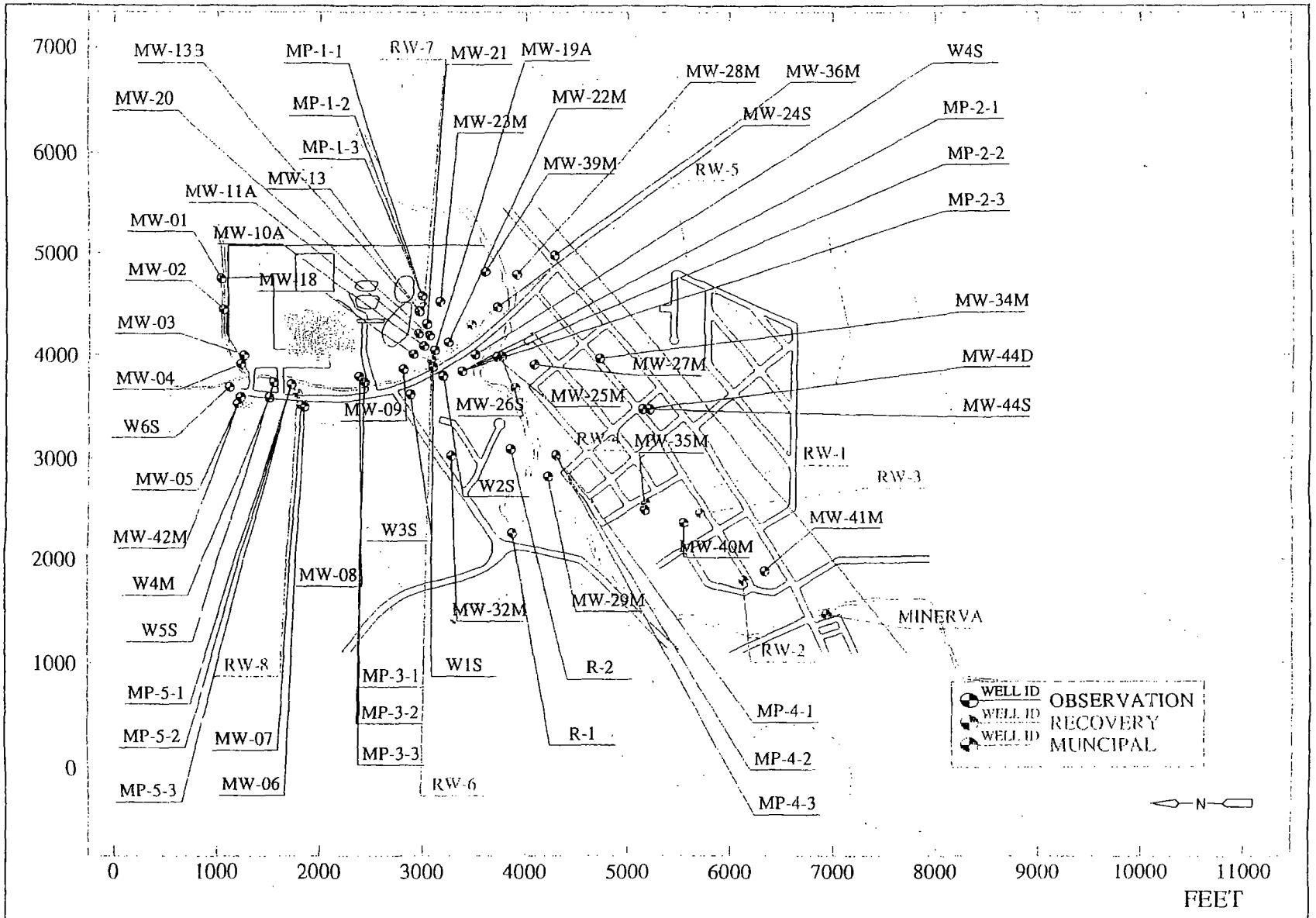


FIGURE 18	Location of Existing Monitoring Wells and Recovery Wells Location of Minerva Municipal Well Field Former TRW Facility - Minerva, Ohio	consulting engineering construction operations CDM

(From Camp Dresser & McKee, 2000)

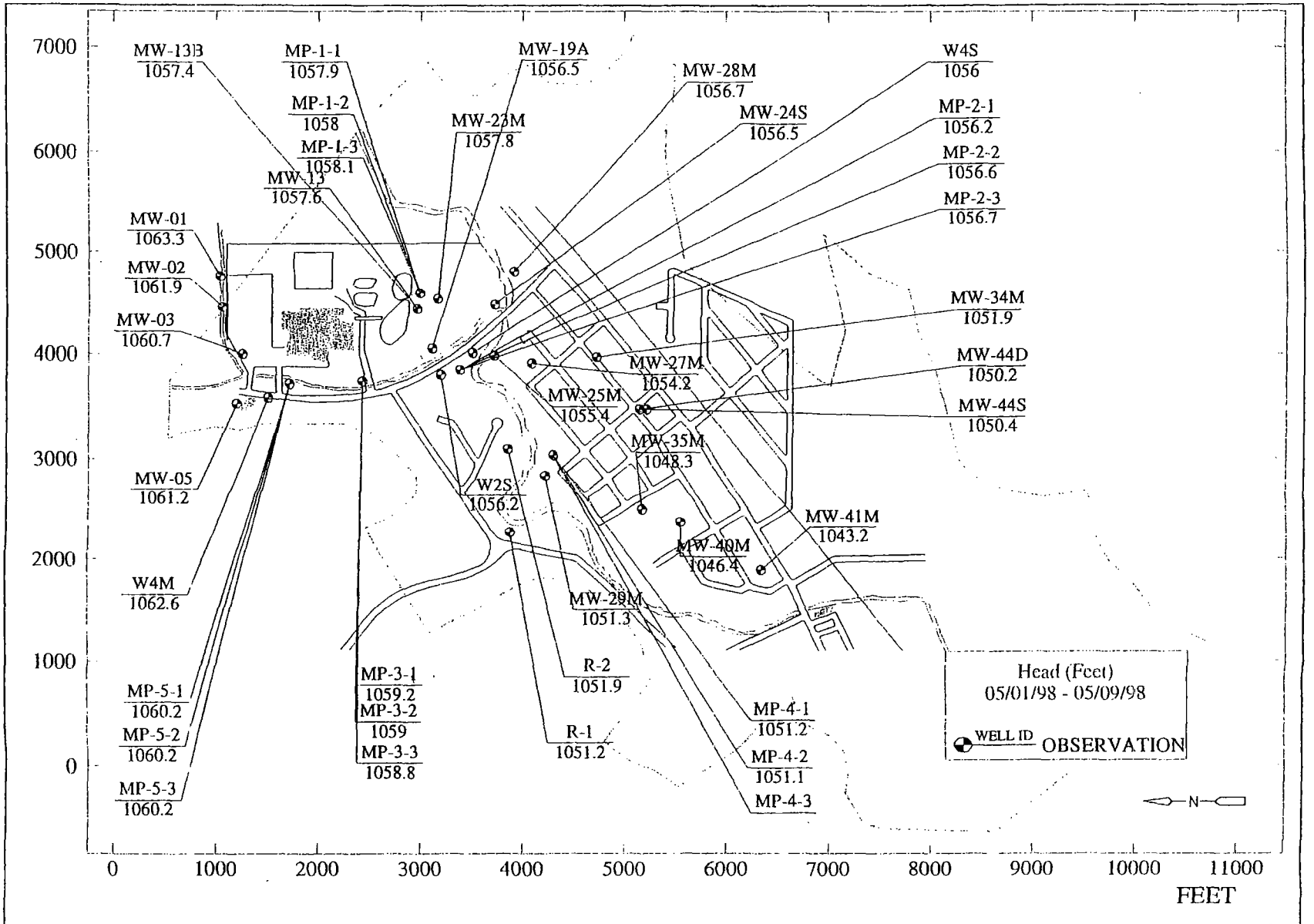


FIGURE 19	Observed Groundwater Elevations May 1998 Former TRW Facility - Minerva, Ohio	consulting engineering construction operations CDM

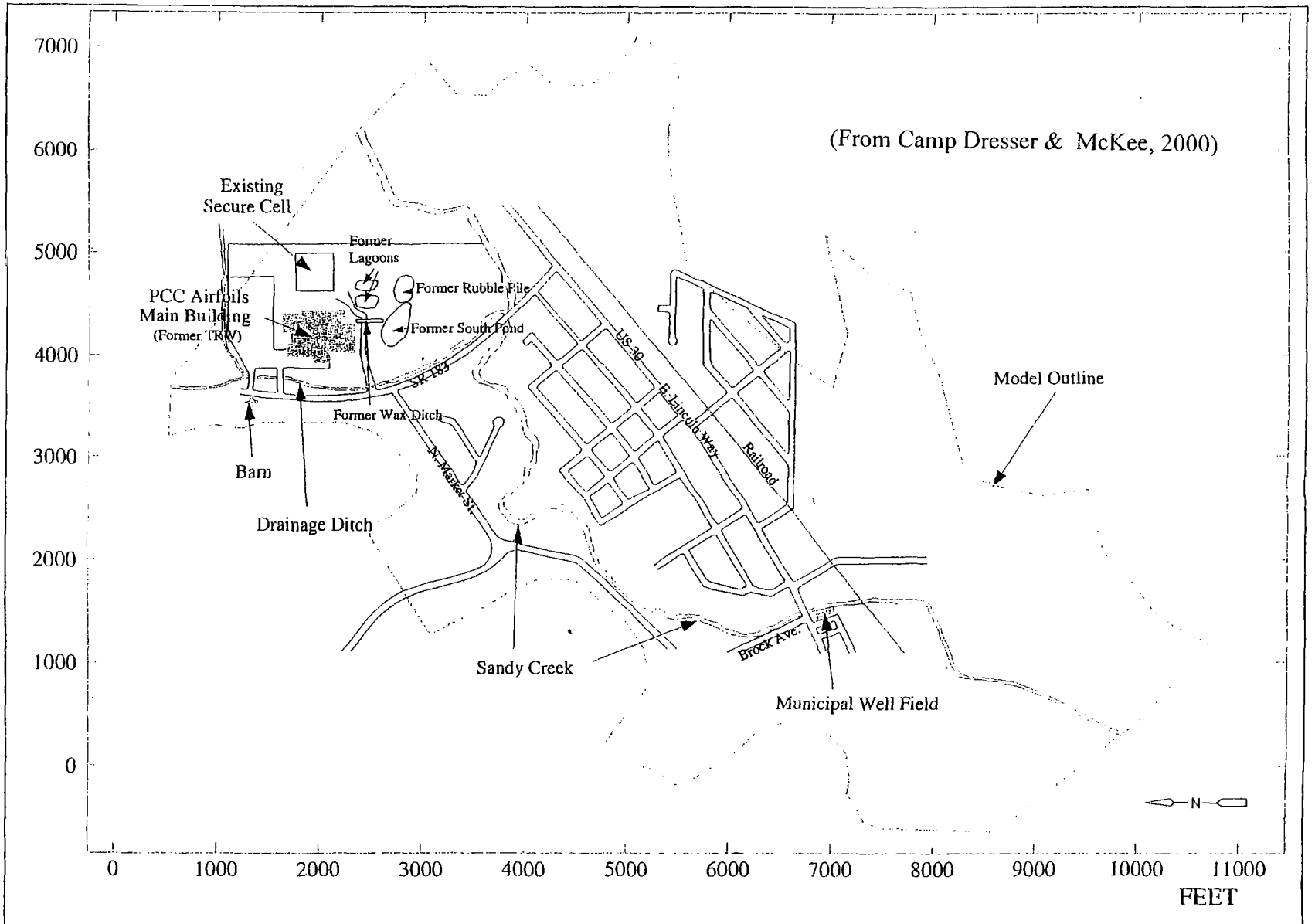


FIGURE 20	Area Map Former TRW Facility - Minerva, Ohio	consulting engineering construction operations CDM

TABLES

TABLE 1

IS LOCATED IN THE TEXT

TABLE 2

GROUNDWATER SAMPLING RESULTS
(all concentrations are in parts per billion)

Well Number	1,1,1-TCA Geo. Mean	1,1,1-TCA Max	1,1-DCA Geo. Mean	1,1-DCA Max	CA Geo. Mean	CA Max	PCE Geo. Mean	PCE Max	TCE Geo. Mean	TCE Max	1,1-DCE Geo. Mean	1,1-DCE Max	trans-1,2 DCE Geo. Mean	trans-1,2 DCE Max	VC Geo. Mean	VC Max	Number of Samples
Upgradient																	
1	ND[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13
2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Central Area (South Property)																	
8	6	10	ND	ND	ND	ND	ND	ND	5	6	ND	ND	ND	ND	ND	ND	3
9	24	30	19	22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
10/10A	--	(11)	170	290	ND	ND	ND	ND	117	160	--	(18)	254	500	12	52	14
11/11A	ND	ND	65	130	ND	ND	ND	ND	27	160	ND	ND	93	160	14	82	9
12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9	114	--	(18)	9
13	--	(12)	400	2000	56	610	ND	ND	--	(18)	ND	ND	93	640	73	235	7
14	ND	ND	ND	ND	ND	ND	ND	ND	7	15	ND	ND	15	30	ND	ND	5
18	ND	ND	175	790	335	1700	ND	ND	12	140	ND	ND	25	570	ND	ND	4
19/19A	--	(12)	203	1500	ND	ND	ND	ND	206	1300	11	350	237	1300	30	190	14
20	ND	ND	6	12	--	(45)	ND	ND	ND	ND	ND	ND	13	27	7	26	8
21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17	45	12	62	5
22m	ND	ND	ND	ND	ND	ND	ND	ND	239	560	ND	ND	61	99	ND	ND	4
23m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	(1)	ND	ND	4
24s	ND	ND	ND	ND	ND	ND	ND	ND	--	(1)	ND	ND	ND	ND	ND	ND	5

(From Clement Associates, Inc., November, 1986)

TABLE 2 continued)

Well Number	1,1,1-TCA		1,1-DCA		CA		PCE		TCE		1,1-DCE		trans-1,2 DCE		VC		Number of Samples
	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	
Central Area (South Property) continued																	
R1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
R2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	5	3
W1s	--	(290)	ND	ND	ND	ND	ND	ND	16	86	--	(49)	6	22	--	(2)	4
W2s	ND	ND	--	(39)	ND	ND	ND	ND	14	120	ND	ND	--	(270)	ND	ND	4
W3s	3	13	18	28	ND	ND	ND	ND	--	(2)	--	(1)	4	5	8	13	5
W4s	ND	ND	ND	ND	ND	ND	ND	ND	295	470	ND	ND	58	170	--	(47)	5
32	--	(1)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	(1)	ND	ND	2
Central Area (South of Sandy Creek)																	
25m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	28	5
26s	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
27m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	(1)	19	25	2
34m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Southwest Area																	
29m	--	(1)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2	ND	ND	3
35m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	(1)	29	32	3
37m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	10	2
40m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	15	1
41m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	(1)	ND	ND	2
Eastern Area																	
28m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND.	ND	ND	ND	ND	ND	2
36m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	(1)	ND	ND	2
39m	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1

TABLE 2 continued)

Well Number	1,1,1-TCA		1,1-DCA		CA		PCE		TCE		1,1-DCE		trans-1,2 DCE		VC		
	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Geo. Mean	Max	Number of Samples
Barn Area																	
5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
6	--	(1)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
W5s	8	43	74	170	16	110	ND	ND	33	69	10	22	17	28	--	(1)	6
W6s	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
W4m	177	1000	32	260	ND	ND	115	230	76	240	16	76	17	98	ND	ND	6
42m	4	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2

[a]Detected at 1 ppb in one sample, 2 ppb in one sample

NOTE:

(1) A volatile organic scan (USEPA method 624) was performed on each sample. The table shows only positive results for tetrachloroethylene, trichloroethylene, 1,1,1-trichloroethane and their degradation products. Other compounds, believed to be the result of sample contamination (either field or laboratory) were occasionally detected and are listed in Appendix ED. Otherwise, compounds normally reported in the VOC scan, but not listed in the table were not detected (see text).

(2) Geometric means were computed for all compounds detected in more than one sample, using one-half the detection limit for non-detect readings.

(3) Values in parentheses indicate compounds detected in only one sample.

Key: 1,1,1-TCA = 1,1,1-trichloroethane
1,1-DCA = 1,1-dichloroethane
CA = chloroethane
PCE = tetrachloroethylene
TCE = trichloroethylene
1,1-DCE = 1,1-dichloroethylene
trans-1,2-DCE = trans-1,2-dichloroethylene
VC = vinyl chloride
ND = not detected
-- = Mean not calcualted where comound was detected in only one sample

TABLE 3

RESIDENTIAL WELL SAMPLING[a]

Lot Number	Address	Resident	Date Sampled	Results (ppb)[b]
O.L 86	1003 Stafford	Fry	11/11/85	ND
O.L. 86	1004 Stafford	Baxter	11/11/85	10 (VC)
563/564	820 E. Lincoln Way	Electronic Service	11/11/85	ND
586	1020 E. Lincoln Way	Betz	11/12/85	ND
587	1032 E. Lincoln Way	Haynam	11/11/85	ND
588	1036 E. Lincoln Way	Mason	11/11/85	ND
590	1108 E. Lincoln Way	Cowl	11/11/85 06/02/86	ND ND
595	1017 E. First	J. Clark	11/12/85 12/10/85	1 (VC) ND
603	1112 E. Lincoln Way	Bevington	11/11/85 12/10/85 01/09/86 05/29/86	2 (VC) 2 (VC) 1 (VC) 2 (VC)
604	1116 E. Lincoln Way	Betler	04/29/85 01/28/86 05/29/86	ND 1 (VC) ND
605	1118 E. Lincoln Way	Morgan	04/29/85 01/28/86	ND ND
624	925 E. First	Mutigli	11/11/85	ND
626	921 E. First	Stump	11/11/85	ND

(From Clement Associates, Inc., November, 1986)

TABLE 3 (continued)

RESIDENTIAL WELL SAMPLING[a] (continued)

Lot Number	Address	Resident	Date Sampled	Results (ppb)[b]
639	747 E. First	Thompson	11/11/85	ND
642	715 E. First*	Casale	11/11/85	ND
663	918 E. First	Davison	11/11/85	ND
668	928 E. First	Crowe	11/11/85	ND
822	817 Ike Street	Hodge	11/12/85	1.8 (VC)
			12/05/85	9 (VC)
867	605 Logan	Giovanelli[c]	11/11/85	6 (DCA)
				7 (trans-1,2-DCE)
				57 (VC)
			04/09/86	5 (DCA)
				5 (trans-1,2-DCE)
				15 (VC)
985	4150 Union	Perrin	09/11/84	ND
986	4144 Union	Wartluff	11/06/84	1 (DCA)
				2 (trans-1,2-DCE)
			04/29/85	2 (TCE)
988	4134 Union	Grimes	09/11/84	ND
			11/06/84	ND
			12/05/84	ND
			04/29/85	T (TCE)

*Resident claims to be on city water

TABLE 3 (continued)

RESIDENTIAL WELL SAMPLING[a] (continued)

Lot Number	Address	Resident	Date Sampled	Results (ppb)[b]
989	16424 Delmar	Brown	09/11/84	ND
			12/05/84	ND
990	16440 Delmar	Reed	11/06/84	ND
			04/29/85	ND
991	16464 Delmar	Miller	09/11/84	ND
			11/06/84	ND
			12/05/84	ND
			04/29/85	ND
992	16480 Delmar[d]	Mallernee	11/06/84	2 (DCA)
				2 (TCA)
992	16484 Delmar[d]	Osborne	11/06/84	2 (DCA)
				2 (TCA)
			12/05/84	1 (DCA)
				2 (TCA)
			04/29/85	ND
994	16492 Delmar	Jackson	12/05/84	2 (VC)
995/6/7	16516 Delmar[e]	Fry	09/11/84	ND
			11/01/84	2 (VC)
998	16540 Delmar	Bush	09/11/84	ND
	16538 Delmar[f]	Crawford	11/06/84	8 (VC)
			12/05/84	13 (VC)
999	16535 Delmar[g]	Criss/Steen	09/11/84	ND
			11/06/84	9 (VC)
			12/05/84	13 (VC)

TABLE 3 (Continued)

RESIDENTIAL WELL SAMPLING[a] (continued)

Lot Number	Address	Resident	Date Sampled	Results (ppb)[b]
1000	16516 Delmar[h]	Dager	12/05/84	2 (VC)
	16517 Delmar[h]	Klug	11/01/84	11 (VC)
			12/05/84	16 (VC)
1001	4126-4124 Marihill	Niuman	09/11/84	ND
			11/01/84	2 (VC)
			12/05/84	9 (VC)
1002	4121 Marihill	D. Miller	09/11/84	ND
			04/29/84	ND
1003	4113 Marihill/ 4111 Marihill[i]	Eddy/ Phillips	09/11/84	1 (trans-1,2-DCE)
			11/01/84	2 (VC)
			12/05/84	3 (VC)
1004	4100 Marihill	Baith	11/01/84	7 (VC)
			12/05/84	15 (VC)
1005	4090 Marihill	J. Steen	09/11/84	1 (DCA)
				2 (trans-1,2-DCE)
			11/01/84	1 (DCA)
				2 (trans-1,2-DCE)
				8 (VC)
			12/05/84	ND
1006/1007	4076 Marihill	Owens	Not Sampled:	Resident not home
1008	4066 Marihill	L. Steen	09/11/84	3 (DCA)
				3 (trans-1,2-DCE)

RESIDENTIAL WELL SAMPLING[a] (continued)

Lot Number	Address	Resident	Date Sampled	Results (ppb)[b]
1008 (continued)			11/01/84	2 (DCA) 2 (trans-1,2-DCE) 12 (VC)
1015	4201 Union	Unkefer	11/11/85	ND
1021	1000 Stafford	Bolin	11/11/85 12/04/85	9 (VC) 19 (VC)
1049	3616 Union	Koch	11/11/85	ND
--	4100 Union	Kail	09/11/84 11/06/84 04/29/85	ND ND ND
--	22142 State Route 30	Cobadesh	12/05/84	ND
--	3691 Union	C. Clark	11/11/85	ND
--	713 E. First	Welch	11/11/85	ND
--	22166 State Route 30	McCulley	01/22/86	2 (trans-1,2-DCE)
--	4090 Whitacre	Hawk	12/04/85	ND
--	714 E. First	Koniecko	12/04/85	ND
--	4030 Whitacre	Gross	12/04/85	ND
--	4054 Whitacre	Kohl	01/09/86	ND
--	22134 State Route 30	Lewis	03/10/86 06/09/86	ND ND
--	732 McDaniel Ave	-	05/29/86	ND
--	730 Shallow Run	-	06/09/86	ND

NOTES:

TABLE 3 (continued)

[a]All samples analyzed for volatile organics using USEPA method 524. Lot numbers 985, 988, 991, 995/6/7, 998, 999, 1001, 1002, 1003, 1008, 4201 Union and 4100 Union were analyzed for PCBs using USEPA Method 8080. No PCBs were detected at or above the detection limit of 1 ppb.

[b]ND = none detected (detection limit of 1 ppb)
VC = vinyl chloride (chloroethene)
DCA = 1,1-Dichloroethane
trans-1,2-DCE = trans-1,2-Dichloroethene
TCE - trichloroethene
TCA - trichloroethane
T = trace, compound detected below method detection limit, but not quantifiable

[c]Well water use only for pool and car washing. City water used for drinking

[d]Duplex: 16480 and 16486 Delmar used the same well

[e]Duplex: 16516 and 16496 Delmar used the same well

[f]Duplex: 16540 and 16538 Delmar used the same well

[g]Duplex: 16535 and 16537 Delmar used the same well

[h]Duplex: 16517 and 16516 Delmar used the same well

[i]Duplex: 4113 Marihill and 4111 Marihill used the same well

TABLE 4

May 6, 1994

CURRENT RESIDENTIAL WELL USERS

800 N. Market St., Everett Eltringham
730 N. Market St., Kenneth Lewis, 216-868-3035
740 N. Market St., ??
760 N. Market St., Gomer Jenkins, 216-868-4705
*901 N. Market St., Wendell Smith, 216-868-4682
*1021 N. Market St., Tim Blackburn, 8005 Stump Rd. Minerva, 216-868-6229
1115 N. Market St., Homer Unkefer, 216-868-6419

*4151 Whitacre Ave., S.E., Edward Libby, 216-868-6552

4011 Blackburn Dr., James Blackburn, 216-868-3629

713 E. First St., Ruth Welch Estate
747 E. First St., Mrs. Virginia Thompason,
921 E. First St., Earl Stump
925 E. First St., Don Mutigili, 216-868-6610
916 E. First St., Edward Davison, 216-868-4434

105 & 107 Lindimore St., Frank Simmons, 405 McDowell, Minerva, 216-868-4442
300 Lindimore St., Carl Comsia, 216-868-6113

732 McDaniel Ave., Alice I Rocco, 216-868-5353
808 McDaniel Ave., Lee F. McGrew, 216-868-4474
809 McDaniel Ave., Richard Wickersham, 216-868-4091

728 Allen Ave., William Reckner, 216-868-5561

820 E. Lincoln Way, Electronic Service, 216-868-4264 ~~This is commercial
925 E. Lincoln Way, William Palmer, 917 E. Lincoln Way, Minerva, 216-868-5303
1020 E. Lincoln Way, Kenneth Blevins, 216-868-3422
1032 E. Lincoln Way, Gordon Isenhour, 216-868-6374
1036 E. Lincoln Way, Daniel Mason, 216-868-4069
1108 E. Lincoln Way, Joseph Crowl, 216-868-5531
1116 E. Lincoln Way, Raymond Betler, 216-868-3158
1118 E. Lincoln Way, Lynn Morgan, 216-868-6911

*Out of Corporation Limits

TABLE 5

ALTERNATE CONCENTRATION LIMITS (ACLs)
TRW SITE, MINERVA, OHIO

	On-Site Compliance Points (Note 1) (ppb)	Off-Site Compliance Points (Note 2) (ppb)	Maximum Contaminant Levels (MCLs)
Tetrachloroethylene	90	NA	5
Trichloroethylene	420	NA	5
1,1-Dichloroethylene	8	NA	7
trans-1,2-Dichloroethylene	9,330	NA	100
Vinyl Chloride	2	1	2
1,1,1-Trichloroethane	26,670	NA	200
1,1-Dichloroethane	112,000	NA	--
Chloroethane	240,000	NA	--

NA - Not Applicable, compound not detected off-site.

Note 1 - "On-site Compliance Points" are wells 13, 19a, W4m and 24s

Note 2 - "Off-site Compliance Points" are wells 34m, 35m, 41m, 44s and 44d

(Modified from Clement Associates, Inc., June, 1992)

TABLE 6

PREDICTED GROUNDWATER CONCENTRATIONS 1 YEAR, 5 YEARS, AND 10 YEARS INTO REMEDIATION (a)

(All concentrations in ppb)

ACL Compliance Point	Initial Concentration (b)	1 Year	5 Years	10 Years
W4m:				
Tetrachloroethylene	230	190	25	5
Trichloroethylene	240	200	25	5
1,1-Dichloroethylene	76	60	10	2
trans-1,2-Dichloroethylene	98	80	10	2
1,1,1-Trichloroethane	1,000	820	100	20
1,1-Dichloroethane	210	30	30	< 1
19a:				
Trichloroethylene	1,300	1,050	35	8
1,1-Dichloroethylene	350	280	10	2
trans-1,2-Dichloroethylene	1,300	1,050	35	8
Vinyl chloride	150	150	4	1
1,1-Dichloroethane	1,500	1,210	40	9
13:				
trans-1,2-Dichloroethylene	640	530	80	20
Vinyl chloride	235	190	30	6
1,1-Dichloroethane	2,000	1,650	240	50
Chloroethane	610	500	70	20
24s, ND	< 1	< 1	< 1	< 1
35m, Vinyl chloride	32	30	25	17
34m, ND	< 1	< 1	< 1	< 1
41m	< 1	< 1	< 1	< 1
44s	(c)	< 1	< 1	< 1
44d	(c)	< 1	< 1	< 1

(a) Concentrations are accurate within a factor of 2.
(b) Maximum contaminant concentrations detected in each well at the time of the supplemental feasibility study.
(c) No data available; wells were proposed at the time of the predictions.

ND = None detected.

(From Clement Associates, Inc., June, 1992)

TABLE 7

GROUND WATER QUALITY DATA
TRW INC.
MINERVA, OHIO

WELL NO.		SAMPLING DATE	1,1,1-TCA	1,1-DCA	CHLORO-ETHANE	PCE	TCE	1,1-DCE	1,2-DCE	VINYL CHLORIDE	TOTAL VOCs
1		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/11/92	Dry								
2		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/11/92	Dry								
3		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/12/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
4		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
5		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/12/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
6		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/12/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
7		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
8		1986 (1)	6	ND	ND	ND	5	ND	ND	ND	11
		5/2/91	1	1	ND	ND	ND	ND	ND	ND	2
		2/11/92	Dry								
9		1986 (1)	24	19	ND	ND	ND	ND	ND	ND	43
		5/2/91	ND	1	ND	ND	ND	ND	ND	ND	1
		2/11/92	Dry								
10a		1986 (1)	ND	170	ND	ND	117	ND	254	12	553
		5/2/91	ND	8	ND	ND	22	ND	20	ND	50
		2/11/92	Dry								
11a		1986 (1)	ND	65	ND	ND	27	ND	93	14	199
13		1986 (1)	ND	400	56	ND	ND	ND	93	73	622
13b (2)		11/7/90	ND	590	250	ND	ND	262	ND	209	1311
13b (2)	Rep 1	2/11/92	22	390	ND	ND	ND	ND	150	ND	562
13b (2)	Rep 2	2/11/92	28	410	ND	ND	ND	ND	150	ND	588
13b (2)	Rep 3	2/11/92	24	390	ND	ND	ND	ND	140	ND	554
	1992	*average*	*25*	*397*					*147*		*568*

(From O'Brien & Gere, June, 1992)

TABLE 7 (continued)

GROUND WATER QUALITY DATA
TRW INC.
MINERVA, OHIO

WELL NO.		SAMPLING DATE	1,1,1-TCA	1,1-DCA	CHLORO-ETHANE	PCE	TCE	1,1-DCE	1,2-DCE	VINYL CHLORIDE	TOTAL VOCs
18		1986 (1)	ND	175	335	ND	12	ND	25	ND	547
19a		1986 (1)	ND	203	ND	ND	206	11	237	30	687
	Rep 1	2/11/92	ND	39	ND	ND	15	ND	99	12	165
	Rep 2	2/11/92	ND	37	ND	ND	11	ND	86	19	153
	Rep 3	2/11/92	ND	47	ND	ND	13	ND	98	28	186
	1992	*average*		*41*			*13*		*94*	*20*	*168*
20		1986 (1)	ND	6	ND	ND	ND	ND	13	7	26
21		1986 (1)	ND	ND	ND	ND	ND	ND	17	12	29
22m		1986 (1)	ND	ND	ND	ND	239	ND	61	ND	300
23m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/12/92	ND	8	ND	ND	ND	ND	5	13	26
24s		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Rep 1	2/11/92	ND	ND	ND	1	ND	ND	ND	ND	1
	Rep 2	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 3	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1992	*average*									*<1*
25m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	6	6
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/12/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
26s		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
27m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	19	19
		5/2/91	ND	ND	ND	ND	ND	ND	ND	11	11
		2/12/92	ND	ND	ND	ND	ND	ND	ND	4	4
28m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/12/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
29m		1986 (1)	ND	ND	ND	ND	ND	ND	2	ND	2
		5/2/91	ND	ND	ND	ND	ND	ND	1	ND	1
		2/12/92	ND	ND	ND	ND	ND	ND	2	ND	2

TABLE 7 (continued)

GROUND WATER QUALITY DATA
TRW INC.
MINERVA, OHIO

WELL NO.		SAMPLING DATE	1,1,1-TCA	1,1-DCA	CHLORO-ETHANE	PCE	TCE	1,1-DCE	1,2-DCE	VINYL CHLORIDE	TOTAL VOCs
32m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2/12/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	DUP.	2/12/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
34m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Rep 1	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 2	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 3	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1992	*average*									*ND*
35m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	29	29
	Rep 1	2/11/92	ND	ND	ND	ND	ND	ND	ND	3	3
	Rep 2	2/11/92	ND	ND	ND	ND	ND	ND	ND	3	3
	Rep 3	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1992	*average*									*2*
36m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
39m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
40m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	15	15
		5/2/91	ND	ND	ND	ND	ND	ND	ND	22	22
		2/12/92	ND	ND	ND	ND	ND	ND	ND	14	14
41m		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Rep 1	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 2	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 3	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1992	*average*									*ND*
42m		1986 (1)	4	ND	ND	ND	ND	ND	ND	ND	4
44s	Rep 1	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 2	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 3	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1992	*average*									*ND*
44d	Rep 1	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 2	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Rep 3	2/11/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1992	*average*									*ND*

TABLE 7 (continued)

GROUND WATER QUALITY DATA
TRW INC.
MINERVA, OHIO

WELL NO.		SAMPLING DATE	1,1,1-TCA	1,1-DCA	CHLORO-ETHANE	PCE	TCE	1,1-DCE	1,2-DCE	VINYL CHLORIDE	TOTAL VOCs
W1s		1986 (1)	ND	ND	ND	ND	16	ND	6	ND	22
W2s		1986 (1)	ND	ND	ND	ND	14	ND	ND	ND	14
W2s		5/2/91	ND	150	ND	ND	280	ND	910	ND	1,340
W2s		2/12/92	ND	730	ND	ND	410	ND	2,700	ND	3,840
W3s		1986 (1)	3	18	ND	ND	ND	ND	4	8	33
W3s		5/2/91	ND	8	ND	ND	ND	ND	ND	3	11
W3s		2/12/92	ND	15	ND	ND	ND	ND	2	4	21
W4s		1986 (1)	ND	ND	ND	ND	295	ND	58	ND	353
W4s		5/2/91	ND	ND	ND	ND	360	ND	ND	ND	360
W4s		2/12/92	ND	ND	ND	ND	27	ND	120	14	161
W4m		1986 (1)	177	32	ND	115	76	16	17	ND	433
W4m		5/2/91	NA	NA	NA	NA	NA	NA	NA	NA	NA
W4m	Rep 1	2/11/92	140	22	ND	180	24	ND	31	ND	397
W4m	Rep 2	2/11/92	130	21	ND	280	32	ND	43	ND	506
W4m	Rep 3	2/11/92	210	27	ND	180	28	ND	39	ND	484
	1992	*average*	*160*	*23*		*213*	*28*		*38*		*462*
W5s		1986 (1)	8	74	16	ND	33	10	17	ND	158
W6s		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
R-1		1986 (1)	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/2/91	ND	ND	ND	ND	ND	ND	ND	ND	ND
		5/7/92	ND	ND	ND	ND	ND	ND	ND	ND	ND
R-2		1986 (1)	ND	ND	ND	ND	ND	ND	ND	4	4
		5/2/91	ND	ND	ND	ND	ND	ND	ND	84	84
		5/7/92	ND	2	ND	ND	ND	ND	3	38	43

NOTES: *All values reported in parts per billion (ppb)*
1,1,1-TCA - 1,1,1-Trichloroethane
1,1-DCA - 1,1-Dichloroethane
PCE - Tetrachloroethene
1,1-DCE - 1,1-Dichloroethene
1,2-DCE - 1,2-Dichloroethene
NA - Not analyzed
ND - Not detected

(1) Concentration is the geometric mean of data collected prior to system start-up.
(2) Well 13b was sampled because Well 13 was dry.

TABLE 8

TRW - MINERVA
GROUND WATER DATA
MAY 1, 199.2 TO AUGUST 3, 1994

Well No.	Sampling Date	1,1,1-TCA	1,1-DCA	Chloroethane	PCE	TCE	1,1-DCE	1,2-DCE	VC
W4m	05/01/92	106	<50	<50	218	<50	<50	<50	<50
	08/12/92	119	<25	<25	202	43	<25	48	<25
	02/04/93	52	<20	<20	153	23	<20	29	<20
	05/12/93	71	6	<10	153	26	<10	32	<10
	08/11/93	75	<20	<20	286	40	<20	62	<20
	11/10/93	51	<10	<10	137	26	<10	24	<10
	02/03/94	36	<10	<10	150	13	<10	<10	<10
	05/13/94	43	<20	<20	209	<20	<20	22	<20
	08/03/94	84	34	<20	281	41	<20	61	<20
19a	05/01/92	<10	<10	<10	<10	<10	<10	47	<10
	08/12/92	<10	24	<10	<10	<10	<10	81	55
	02/04/93	<5	12	<5	<5	<5	<5	76	19
	05/12/93	<2.5	7.1	<2.5	<2.5	2.7	<2.5	21	39
	08/11/93	<10	20	<10	<10	<10	<10	58	72
	11/10/93	<5	26	<5	<5	<5	<5	39	87
	02/03/94	<1	<1	<1	<1	<1	<1	<1	<1
	05/13/94	<2.5	19	<2.5	<2.5	<2.5	<2.5	34	34
	08/03/94	<2.5	21	<2.5	<2.5	<2.5	<2.5	29	28
13b	05/01/92	<25	202	<25	<25	<25	<25	118	<25
	08/12/92	32	486	170	<50	33	<50	210	143
	02/04/93	21	282	44	<25	35	<25	252	73
	05/12/93	42	179	131	<10	31	<10	81	96
	08/11/93	31	277	158	<20	51	<20	203	60
	11/10/93	43	426	206	<25	67	<25	293	117
	02/03/94	<20	104	36	<20	<20	<20	53	17
	05/13/94	<20	230	143	<20	<20	<20	120	<20
	08/03/94	<50	330	161	<50	<50	<50	173	<50
35m	05/01/92	<1	<1	<1	<1	<1	<1	<1	2
	08/12/92	<1	<1	<1	<1	<1	<1	<1	1
	02/04/83	<1	<1	<1	<1	<1	<1	<1	5
	05/12/93	<1	<1	<1	<1	<1	<1	<1	11
	08/11/93	<1	<1	<1	<1	<1	<1	<1	4
	11/10/93	<1	<1	<1	<1	<1	<1	<1	13
	02/03/94	<1	<1	<1	<1	<1	<1	<1	3.9
	05/13/94	<1	<1	<1	<1	<1	<1	<1	3.9
	08/03/94	<1	<1	<1	<1	<1	<1	<1	7.4

TABLE 9

TRW INC.
MINERVA, OHIO
ACTUAL VS. PREDICTED VOC CONCENTRATIONS
5 YEARS INTO REMEDIATION

ACE COMPLIANCE POINT	COMPOUND	INITIAL CONCENTRATION[a]	PREDICTED CONCENTRATION FOLLOWING 5 YEARS OF REMEDIATION[b]	ACTUAL CONCENTRATION (2/12/92)[c]	ACTUAL CONCENTRATION (8/3/94)
W4m	Tetrachloroethylene	230	25	213	281
	Trichloroethylene	240	25	28	41
	1,1-Dichloroethylene	76	10	<10	<20
	t-1,2-Dichloroethylene	98	10	38	61
	1,1,1-Trichloroethane	1000	100	160	84
	1,1-Dichloroethane	210	30	23	34
	TOTAL	1854	200	462	501
13[d]	t-1,2-Dichloroethylene	640	80	147	173
	Vinyl Chloride	235	30	<20	<50
	1,1-Dichloroethane	2000	240	397	330
	Chloroethane	610	70	<20	161
	1,1,1,-Trichloroethane	12	---[e]	25	<50
	TOTAL	3485	420	568	664
19a	Trichloroethylene	1300	35	13	<2.5
	1,1-Dichloroethylene	350	10	<5	<2.5
	t-1,2-Dichloroethylene	1300	35	94	29
	Vinyl Chloride	150	4	20	28
	1,1-Dichloroethane	1500	40	41	21
	TOTAL	4600	124	168	78
24s	ND	<1	<1	<1	<1
34m	ND	<1	<1	<1	<1
35m	Vinyl Chloride	32	25	2	7.4
41m	ND	<1	<1	<1	<1
44s		[f]	[f]	<1	<1
44d		[f]	[f]	<1	<1

(Modified from O'Brien & Gere, June, 1992)

TABLE 9
(continued)

Note: All concentrations in ppb.

ND - None Detected.

(a)- Initial concentration is the maximum concentration detected during background monitoring conducted from June 1984 to April 1986 as presented by Clement Associates, Inc. in the Supplemental Ground Water Feasibility Study (1986) on Table 7-5.

(b)- Concentrations were predicted from modeling completed by Clement Associates, Inc. and presented in the Supplemental Ground Water Feasibility Study (1986) on Table 7-5.

(c)- 1992 concentrations are the average of three replicate samples collected on one date.

(d)- The initial concentration of 12 ppb was detected in well 13. Well 13b has been used as a replacement for this well. Data presented for 2/12/92 are for well 13b.

(e) - 1,1,1-Trichloroethane concentrations were not predicted by Clement Associates, Inc. as part of their modeling effort.

(f)- These wells did not yet exist when modeling was conducted by Clement Associates, Inc.

TABLE 10

June 21, 2000

CURRENT RESIDENTIAL WELL USERS

800 N. Market St., Robert E. Edwards, 330-868-3853
730 N. Market St., Kenneth Lewis, 330-868-3035
740 N. Market St., Robert Eddy, 330-868-7913
760 N. Market St., Mrs. Gomer Jenkins, 330-868-4705
*901 N. Market St., Tom Wickersham, 330-868-5537
*1021 N. Market St., Tim Blackburn, 330-868-6229
1115 N. Market St., Homer Unkefer, 330-868-6419

*4151 Whitacre Ave. S.E., Edward Libby, 330-868-6552
*4054 Whitacre Ave., Khal

4011 Blackburn Dr., Robert Blackburn, 330-868-4483

747 E. First St., Mrs. Virginia Thompson
921 E. First St., Earl Stump, 330-868-6944
916 E. First St., Edward Davison, 330-868-4434

107 Lindimore St., Mrs. Frank Simmons, c/o William Palmer, 917 E. Lincoln Way, 333-868-5303
300 Lindimore St., Carl Comsia, 330-868-6113

809 McDaniel Ave., Richard Wickersham, 330-868-4091

728 Allen Ave., William Reckner, 330-868-5561

820 E. Lincoln Way, Electronic Service, 330-868-4264 (Commercial)
1020 E. Lincoln Way, Kenneth Blevins, 330-868-3422
1032 E. Lincoln Way, Gordon Isenhour, 103 East St., 330-868-1099
1036 E. Lincoln Way, Mrs. Daniel Mason, 330-868-4069
1108 E. Lincoln Way, Joseph Crowl, 330-868-5531
1118 E. Lincoln Way, Lynn Morgan, 330-868-6911

*Out of corporation

RESIDENTIAL USERS ON MUNICIPAL WATER SINCE MAY 6, 1994

713 E. First St., Gordon Isenhour, 103 East St., 330-868-1099 (5/17/94)
925 E. First St., Don Mutigili, 330-868-6610 (4/11/97)
105 Lindimore, Mrs. Frank Simmons c/o Wm Palmer, 917 E. Lincoln Way, 330-868-5303 (9/25/96)
732 McDaniel Ave., Alice Rocco, 330-868-5353 (9/7/95)
808 McDaniel Ave., Lee F. McGrew, 330-868-4474 (4/15/97)
925 E. Lincoln Way, Bradley Palmer, 330-868-5210 (6/15/94)
1116 E. Lincoln Way, Paul Hoffmeyer, 330-868-6328 (11/8/94)

TABLE 11

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

WELL: 13 (or 13B when Well 13 is dry)

μg/L

< = Method Detection Limit

Date in Quarters/Year	*2/95	*3/95	*4/95	*1/96	*2/96	*3/96	*4/96	*1/97	*2/97	*3/97	*4/97	*1/98	2/98	*3/98	*4/98	1/99	2/99	3/99	*4/99	*1/00
1,1,1-Trichloroethane	<20	25.3	<20	<10	<10	<10	<10	<2.5	<10	<10	▲5.0(μ)	<10	<1	<5	<5	<1	<1	<1	<5	<1
1,1-Dichloroethane	432.4	853.3	327.7	94.7	116.3	166.6	119.7	10.9	55.8	120.0	96.0	100.0	2	96.0	97.0	9.1	28.0	13.0	74.0	1.1
Chloroethane	186.4	196.7	176.7	29.6	46.9	85.0	55.9	9.6	21.3	29.0	16.0	23.0	<1	13.0	<5	<1	<1	<1	<5	<1
Tetrachloroethene	<20	<20	<20	<10	<10	<10	<10	<2.5	<10	<10	▲5.0(μ)	<10	<1	<5	<5	<1	<1	<1	<5	<1
Trichloroethene	<20	36.7	<20	<10	<10	16.9	<10	<2.5	<10	12.0	11.0	<10	<1	13.0	16.0	<1	1.4	<1	14.0	<1
1,1-Dichloroethene	<20	<20	<20	<10	<10	<10	<10	3.1	<10	<10	▲5.0(μ)	<10	<1	<5	<5	<1	<1	<1	<5	<1
Trans-1,2-Dichloroethene	<20	<20	<20	<10	<10	<10	<10	<2.5	<10	<10	▲5.0(μ)	<10	<1	<5	<5	<1	<1	<1	<5	<1
Vinyl Chloride	85.3	113.3	79.0	14.2	18.6	43.0	44.6	5.9	23.8	28.0	31.0	20.0	<1	43.0	35.0	3.1	5.8	<1	30.0	43.0
Cis-1,2-Dichloroethene	185.0	203.3	163.3	75.7	45.9	110.0	57.6	10.3	32.3	100.0	110.0	86.0	<1	91.0	120.0	<1	7.0	2.0	100.0	2.1

* & Date = Well 13B was sampled because Well 13 was dry at the time of sampling

▲ (u) = <MDL

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

TABLE 11 (Continued)

WELL: 24S

µg/L

< = Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE 11 (Continued)

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

WELL: 44S

µg/L

< = Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE 11 (Continued)

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

WELL: 44D

µg/L

<= Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

TABLE 11 (Continued)

WELL: 41M

µg/L

< = Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

TABLE 11 (Continued)

WELL: 34M

µg/L

< = Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE 11 (Continued)

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

WELL: 35M

µg/L

< = Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	<1	<1	2.1	1.1	<1	2.7	2.6	2.2	5.5	3.4	2.8	<1	2.6	<1	3.6	10.0	12.0	4.8	2.6	2.6
Cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE 11 (Continued)

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

WELL: 19A

μg/L

< = Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	<2.5	<2.5	<2.5	<1	<1	<5	<2.5	<1	<2.5	<2.5	<2.5	<1	<1	<1	<1	<1	<1	<1	<1	<5
1,1-Dichloroethane	18.9	39.3	11.0	1.6	★ detected	<5	<2.5	<1	<2.5	<2.5	<2.5	1.3	1.6	2.2	1.2	1.3	1.6	<1	1.2	63.0
Chloroethane	<2.5	<2.5	11.0	4.7	<1	<5	<2.5	<1	<2.5	<2.5	<2.5	<1	<1	<1	<1	<1	<1	<1	<1	<5
Tetrachloroethene	<2.5	<2.5	<2.5	<1	<1	<5	<2.5	<1	<2.5	<2.5	<2.5	<1	<1	<1	<1	<1	<1	<1	<1	<5
Trichloroethene	<2.5	<2.5	<2.5	<1	2.4	<5	<2.5	1.6	<2.5	<2.5	<2.5	1.3	<1	<1	<1	1.3	1.7	<1	<1	9.7
1,1-Dichloroethene	<2.5	<2.5	<2.5	<1	<1	<5	<2.5	<1	<2.5	<2.5	<2.5	<1	<1	<1	<1	<1	<1	<1	<1	<5
Trans-1,2-Dichloroethene	<2.5	<2.5	<2.5	<1	<1	<5	<2.5	<1	<2.5	<2.5	<2.5	<1	<1	<1	<1	<1	<1	<1	<1	<5
Vinyl Chloride	49.8	73.3	49.0	25.0	★ detected	29.8	18.9	3.2	12.2	21.0	40.0	26.0	16.0	34.0	37.0	13.0	18.0	48.0	47.0	36.0
Cis-1,2-Dichloroethene	38.5	33.7	25.0	19.3	3.6	19.6	9.1	2.8	8.6	12.0	13.0	9.8	11.0	15.0	14.0	9.3	13.0	12.0	4.2	74.0

★ Mean not calculated where compound was detected in only one sample.

TABLE 11 (Continued)

FIVE - YEAR REVIEW REPORT
TRW MINERVA SITE
ACL COMPLIANCE MONITORING DATA REPORT
SECOND QUARTER 1995 THROUGH FIRST QUARTER 2000

WELL: W4M

µg/L

< = Method Detection Limit

Date in Quarters/Year	2/95	3/95	4/95	1/96	2/96	3/96	4/96	1/97	2/97	3/97	4/97	1/98	2/98	3/98	4/98	1/99	2/99	3/99	4/99	1/00
1,1,1-Trichloroethane	27.9	36.7	30.3	11.0	8.7	21.0	16.0	16.7	13.7	15.0	20.0	N/A	6.2	12.0	16.0	50.0	14.0	10.0	27.0	9.6
1,1-Dichloroethane	<10	<10	<10	<10	<10	17.2	<10	<10	<10	<10	6.9	N/A	<5	7.0	5.7	26.0	7.6	<5	6.0	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5.0	N/A	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	216.5	190.0	133.3	93.3	60.3	129.7	95.3	102.7	73.6	170.0	130.0	N/A	63.0	110.0	120.0	440.0	110.0	89.0	110.0	68.0
Trichloroethene	15.6	17.3	14.7	<10	<10	20.3	11.0	8.9	<10	13.0	10.0	N/A	<5	9.4	9.9	29.0	8.8	7.0	12.0	6.0
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	N/A	<5	<5	<5	<5	<5	<5	<5	<5
Trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	N/A	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	N/A	<5	<5	<5	<5	<5	<5	5.0	<5
Cis-1,2-Dichloroethene	12.6	14.3	<10	<10	<10	44.2	15.0	18.7	20.0	25.0	18.0	N/A	<5	15.0	15.0	54.0	18.0	13.0	13.0	<5

1/98 N/A = Not analyzed. Due to an equipment failure, a sample from this well could not be retrieved.

TABLE 12 (From Camp Dresser & McKee, 2000)

Predicted Groundwater Contaminants Vs. Actual Concentrations

ACL Compliance Point	ACL (µg/L)	Initial Concentrations[a]	Concentrations Predicted by Clement Associates[b] (µg/L)			5-Year Actual Concentration (µg/L)	10-Year Actual Concentration[c] (µg/L)	
			Years into Remediation					
			1 Year	5 Years	10 Years	2/12/92[d]	11/19/99	1999 Range
W4M								
Tetrachloroethylene	90	230	190	25	5	213	110	89 - 440
Trichloroethylene	420	240	200	25	5	28	12	7 - 29
1,1-Dichloroethylene	8	76	60	10	2	<10	<5	<5
trans-1,2- Dichloroethylene	9,330	98	80	10	2	38	<5	<5
1,1,1-Trichloroethane	26,670	1,000	820	100	20	160	27	10 - 50
1,1-Dichloroethane	112,000	210	30	30	<1	23	6	<5 - 26
MW-19A								
Trichloroethylene	420	1,300	1,050	35	8	13	<1	<1 - 1.7
1,1-Dichloroethylene	8	350	280	10	2	<5	<1	<1
trans-1,2- Dichloroethylene	9,330	1,300	1,050	35	8	94	<1	<1
Vinyl Chloride	2	150	150	4	1	20	47	13 - 48
1,1-Dichloroethane	112,000	1,500	1,210	40	9	41	1.2	<1 - 1.6
MW-13B								
trans-1,2- Dichloroethylene	9,330	640	530	80	20	147	<5	<1 - 5
Vinyl Chloride	2	235	190	30	6	<20	30	<1 - 30
1,1-Dichloroethane	112,000	2,000	1,650	240	50	397	74	9.1 - 74
Chloroethane	240,000	610	500	70	20	<20	<5	<1 - 5
1,1,1-Trichloroethane	26,670	12	(e)	(e)	(e)	25	<5	<1 - 5
MW-24S	<1	<1	<1	<1	<1	<1	<1	<1
MW-35M Vinyl Chloride	1	32	30	25	17	2	2.6	2.6 - 12
MW-34M	<1	<1	<1	<1	<1	<1	<1	<1
MW-41M	<1	<1	<1	<1	<1	<1	<1	<1
MW-44S	<1	(f)	(f)	(f)	(f)	<1	<1	<1
MW-44D	<1	(f)	(f)	(f)	(f)	<1	<1	<1

a- Initial concentration is the maximum concentration detected during background monitoring conducted from June 1984 to April 1986 as presented by Clement Associates, Inc. in the Supplemental Ground Water Feasibility Study (1986) on Table 7-5.

b- Concentrations were predicted from modeling completed by Clement Associates, Inc. and presented in the Supplemental Ground Water Feasibility Study (1986) on Table 7-5.

c- Ohio EPA Five-Year Report completed in June 1995. Therefore, 10-Year review was rescheduled for Year 2000. These 1999 data are most recent.

d- 1992 concentrations are the average of three replicate samples collected on one date.

e- 1,1,1-Trichloroethane concentrations were not predicted for MW-13B by Clement Associates, Inc. as part of their modeling effort.

f- These wells did not yet exist when modeling was conducted by Clement Associates, Inc.

TRW MINERVA

TABLE 13

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL W4M

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	12/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	10 (15Re)	11 (13Re)	7 (8.4Re)	12 (9.5Re)	9.8 (9.2Re)	8.5 (8JRe)	5.8 (6.5Re)	8.6 (6.6Re)	5.2 (5.4Re)	3.2 (2.5Re)	2.1 (1.8Re)	5 (4.5Re)	6.5 (5.9Re)	9.7 (8.5Re)	4.9 (4.5Re)	4 (4.1Re)	4.4 (5.4Re)	5.2 (6Re)	4.4 (3.8Re)	6.0 (4.8Re)
1,1- Dichloroethane	112,000	7.6 (11Re)	6.4 (7.5Re)	2.5 (3.6Re)	13 (14Re)	10 (10Re)	3.2 (2.7JRe)	2.5 (2.7Re)	6.4 (5.1Re)	5 (4.8Re)	3.4 (2.3Re)	1.3 (1.3Re)	2.3 (3.2Re)	3.6 (3.4Re)	9.8 (8.6Re)	3.8 (3.9Re)	3 (3.5Re)	4.4 (5.1Re)	6.5 (6.7Re)	5.2 (4.9Re)	5.0 (3.1Re)
Chloroethane	240,000	<2	<2	<2	<2	<1	<2	<2	<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<2
Tetrachloroethene	90	92 (120Re)	84 (120Re)	73 (80Re)	90 (72Re)	73 (69Re)	100 (88JRe)	74 (75Re)	84 (64Re)	61 (64Re)	54 (45Re)	33 (25Re)	76 (77Re)	63 (55Re)	95 (130Re)	65 (52Re)	54 (57Re)	60 (69Re)	71 (72Re)	62 (53Re)	64 (48Re)
Trichloroethene	420	8.5 (10Re)	10 (12Re)	4.9 (6Re)	17 (13Re)	11 (11Re)	9.6 (10JRe)	6.7 (7.7Re)	13 (11Re)	10 (10Re)	6.2 (5.2Re)	3.2 (2.7Re)	7.8 (7.4Re)	7.5 (7Re)	21 (17Re)	11 (9.8Re)	9.7 (10Re)	12 (13Re)	13 (15Re)	9.7 (10Re)	13 (11Re)
1,1-Dichloroethene	112,000	<2	<2	<2	<2	<1	<2	<2	<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<2
trans-1,2-Dichloroethene	9,330	<2	<2	<2	<2	<1	<2	<2	<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	NE*	21 (24Re)	13 (15Re)	7.5 (8.4Re)	49 (37Re)	28 (28Re)	11 (9.9JRe)	6.1 (7.1Re)	19 (17Re)	16 (16Re)	8.3 (7.1Re)	2.6 (2.4Re)	6.2 (6.4Re)	8 (7.7Re)	35 (32Re)	13 (13Re)	10 (11Re)	14 (16Re)	25 (25Re)	19 (17Re)	17 (13Re)
Vinyl Chloride	2**	<2	<2	<2	<2	<1	<2	<2	<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<2

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TRW MINERVA

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 13 (13B)

TABLE 13 (Continued)

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	14 (17Re)	12 (15Re)	2.7 (4.3Re)	5.7 (5Re)	15 (16Re)	<1	9.5 (9.1Re)	11 (9.1Re)	14 (13Re)	11 (9.1Re)	<1	9.6 (11Re)	20 (21Re)	22 (20Re)	17 (16Re)	5.7 (5.9Re)	1.3 (1.4Re)	1.7 (1.9Re)	1.4 (1.2Re)	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	1.5 (1.8Re)	1.5 (1.9Re)	<1	<1	1.8 (1.9Re)	<1	1.1 (1.3Re)	1.7 (1.1Re)	2.8 (2.5Re)	2.2 (1.4Re)	<1	1.9 (1.4Re)	4.9 (4.7Re)	5.6 (4.3Re)	2.4 (2.3Re)	1.8 (1.6Re)	<1	<1	<1	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.4 (1.8Re)	1.9 (1.9Re)	1.4 (1.8Re)	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3 (3.1Re)	5.8 (4.8Re)	2.8 (3Re)	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	3.7 (3.4Re)	2.3 (2.8Re)	<1	1.6 (1.3Re)	4.6 (4.2Re)	<1	4.3 (4.4Re)	9.1 (7.5Re)	15 (15Re)	9.8 (8.6Re)	<1	13 (13Re)	33 (39Re)	46 (47Re)	36 (34Re)	12 (12Re)	2.9 (3.2Re)	4.4 (5.1Re)	2.9 (2.8Re)	3.5 (2.5Re)
Vinyl Chloride	2**	5.2 (5.7Re)	2.3 (2.3Re)	<1	<1	6.1 (6.4Re)	<1	<1	4.3 (3.7Re)	4.6 (5.5Re)	<1	<1	<1	14 (16Re)	34 (32Re)	14 (13Re)	<1	<1	1.0 (1.2Re)	<1	<1

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TRW MINERVA

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 19A

TABLE 13 (Continued)

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	3.7 (1.5Re)	1.3 (1.5Re)	<1	<1	<1	<1	<1	<1	1.3 (1.2Re)	<1	<1	1.2 (2.1Re)	1.2 (1.5Re)	1.2 (1.3Re)	<1	<1	<1	1.6 (2Re)	<1	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	1.4 (1.5Re)	<1	<1	<1	<1	<1	1.5 (1.8Re)	<1	<1	1.8 (1.1Re)	2.1 (1.7Re)	3.3 (2.4Re)	1.9 (1.9Re)	1.4 (1.3Re)	1.4 (1.5Re)	1.9 (1.9Re)	2.2 (2.5Re)	1.5 (2Re)	1.4 (1.6Re)	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	4 (5.9Re)	3 (3.3Re)	4.1 (4.8Re)	6.5 (4.2Re)	5.2 (5.0Re)	5.8 (6.4Re)	5.5 (6.0Re)	11 (9.1Re)	11 (12Re)	4.9 (3.8Re)	3.2 (3.0Re)	7.2 (7.2Re)	7.2 (6.8Re)	9.7 (8.5Re)	2 (1.8Re)	5.1 (5.4Re)	3.2 (3.8Re)	16 (19Re)	3.8 (3.9Re)	5.2 (4.2Re)
Vinyl Chloride	2**	29 (29Re)	47 (47Re)	9.6 (9.3Re)	20 (11Re)	31 (28Re)	25 (26Re)	10 (9.5Re)	21 (22Re)	31 (29Re)	4.9 (3.4Re)	2..2 (1.7Re)	5.3 (6.9Re)	8.5 (9.8Re)	22 (19Re)	1.5 (1.5Re)	7.4 (8.1Re)	22 (18Re)	23 (32Re)	5.4 (7.4Re)	10 (9.0Re)

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TABLE 13 (Continued)

TRW MINERVA

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 24S

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TRW MINERVA

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 34M

TABLE 13 (Continued)

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TRW MINERVA

TABLE 13 (Continued)

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 35M

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.4 (2.4Re)	<1	<1	<1	<1	<1	<1
Vinyl Chloride	1**	6.8 (7.4Re)	4.4 (5.4Re)	7.1 (7.1Re)	5.8 (3.0Re)	5.3 (4.3Re)	9.6 (11Re)	8.6 (7.9Re)	5.3 (5.5Re)	4.7 (5.5Re)	<1	7.7 (6.6Re)	2.9 (2.6Re)	11 (14Re)	11 (10Re)	1.5 (1.3Re)	2.4 (2.4Re)	3.3 (3.3Re)	3.0 (4.1Re)	<1	4.5 (3.5Re)

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TABLE 13 (Continued)

TRW MINERVA

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 41M

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TRW MINERVA

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 44D

TABLE 13 (Continued)

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

TABLE 13 (Continued)

TRW MINERVA

GROUND WATER COMPLIANCE MONITORING POINTS

COMPLIANCE WELL 44S

SAMPLING DATES

ACL Contaminant	ACL	8/2000	11/2000	2/2001	5/2001	8/2001	11/2001	2/2002	6/2002	9/2002	12/2002	3/2003	5/2003	8/2003	11/2003	2/2004	5/2004	8/2004	11/2004	2/2005	5/2005
1,1,1-Trichloroethane	26,670	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1- Dichloroethane	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	240,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	420	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	112,000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	9,330	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	NE*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

NOTES:

All Concentrations are in ug/l.
ACL = Alternate Concentration Level
(<) Denoted compound was not detected in the replicate analyses; NE - Not Established; - Mean not calculated where compound was detected in only one sample.
(a) As reported in Feasibility Study Report, November 1986.
(*) No ACL for cis-1,2-Dichloroethene has been approved by Ohio EPA. The primary drinking water regulations Maximum Contaminant Level (MCL) for cis-1,2-Dichloroethene is 70 ug/l.
(**) Onsite compliance limit for Vinyl Chloride is 2 ppb, while offsite limit is 1ppb.
Re - Replicate Analysis
J = Estimated Result

APPENDIX A

OhioEPA
State of Ohio Environmental Protection Agency
Northeast District Office

2110 E. Aurora Road
Twinsburg, Ohio 44087-1969

TELE (330) 425-9171 FAX (330) 487-0769

Bob Taft, Governor
Christopher Jones, Director

June 11, 2002

RE: TRW MINERVA SITE
STARK COUNTY, OHIO
ID # 276-0827

CERTIFIED MAIL

Mr. Paul Jack
Castle Bay, Inc.
1175 William Pitt Way
Pittsburgh, PA 15238

Dear Mr. Jack:

As you are well aware, TRW Inc. entered into Director's Final Findings and Orders (F&Os), dated May 9, 1986, for the purpose of implementing a subsurface cleanup of environmental contamination at TRW Inc.'s facility, located in Minerva, Ohio. As a result of the F&Os, TRW Inc. has installed and operates a ground water extraction and treatment system at the Site. In addition, two Five-Year Reviews have been conducted for the Site, to evaluate the effectiveness of the remedial actions. The effectiveness of the remedy is important because residential wells that are used for potable water still exist in the area, and Minerva's municipal wells are located less than one mile downgradient from the TRW site.

Although the ground water contaminant levels in the compliance wells have generally dropped over the years, there are still consistent fluctuations of contamination above the applicable cleanup criteria, which have suggested that a source or sources may exist at the Site that may be contributing to the contaminant fluctuations. TRW Inc. made the decision to investigate the possibility of unidentified sources. The result was the report entitled, "Phase II Source Area Investigation Report, Former TRW Inc. Facility, Minerva, Ohio," and dated March 2002.

Ohio EPA has completed its review of the above-mentioned report. The investigation centered around the Central and Barn Areas. The report states that the highest detections of volatile organic compounds (VOCs) were observed in the shallow ground water samples around the former wax ditch area (Central Area). This ground water sampling produced the following results: trichloroethylene (TCE) at 56,000 ug/L; 1,1,1 trichloroethane (TCA) at 21,000 ug/L; cis-1,2 dichloroethene (DCE) at 1,900 ug/L, and total 1,2-DCE at 2,100 ug/L. Ground water sampling around the Barn Area also showed elevated levels of VOCs.

The conclusion of TRW's investigation report states that VOCs in the "parts per million" range and above are assumed to act as a significant source of VOCs to the ground water. The F&Os state in Section V (Work to be Performed), A, 8 that "failure to achieve compliance with the applicable criteria at the compliance monitoring points will result in additional corrective actions by TRW to be specified by Ohio EPA." Given the results of

TRW's recent investigation and the continuing fluctuations in the compliance wells, Ohio EPA finds that it is time for "additional corrective actions" to be taken by TRW Inc. Ohio EPA requests that the following additional corrective actions be undertaken by TRW:

1) Continue to investigate the Barn Area in order to delineate the source area;

2) design and implement a remedy for the source in the Barn Area, as necessary;

3) design and implement a remedy to address the VOCs in soil and ground water in the former wax ditch area (central area);

4) continue to investigate other potential source areas that may be identified in the future.

Please prepare an amendment to the Ground Water Work Plan which outlines a plan for implementation of the tasks described above and submit that amendment to Ohio EPA for review within 60 days of receipt of this letter.

Ohio EPA acknowledges TRW's longstanding commitment to protecting the residential wells in the vicinity of the facility and Minerva's municipal wells. Ohio EPA is hopeful that with TRW's additional corrective actions the sources of contamination at the site will be eliminated and it will be possible to fulfill the requirements of the F&Os. Any questions concerning this matter may be directed to me at (330) 963-1207.

Sincerely,

Vicki Deppisch

Vicki Deppisch
Hydrogeologist/Project Coordinator
Division of Emergency and Remedial Response

VD/kss

cc: Dave Bowland, Ohio EPA, DDAGW, NEDO
Catherine Stroup, Ohio EPA, Legal, CO
Rod Beals, Ohio EPA, DERR, NEDO
Minerva Water Dept.

ec: Mike Eberle, Ohio EPA, DERR, NEDO

CASTLE BAY, INC.

1175 William Pitt Way, Pittsburgh, Pennsylvania 15238

412-826-3277 cbay@telerama.com

Mediation • Environmental Management • Training

August 12, 2002

Ms. Vicki Deppisch
Ohio EPA
Northeast District
2110 E. Aurora Road
Twinsburg, Ohio 44087-1969

Re: TRW Minerva Site – ID # 276-0827
Amendment to Groundwater Work Plan

Dear Ms. Deppisch,

As requested in your letter dated June 11, 2002, herein is a proposed amendment to the Ground Water Work Plan for the Minerva site outlining TRW's proposed plan and schedule for implementation of the corrective actions described.

	Scope of Work Item	Target Due Date
1.	Barn Area: Conduct reconnaissance of barn interior and assessment of past hazardous materials management practices.	September 2002
2.	Barn Area: Design site investigation program to obtain information for assessment of remedial alternatives.	October 2002
3.	Barn Area: OEPA and PCC Airfoils review and comment of investigation program.	November 2002
4.	Barn Area: Implement investigation program.	December 2002
5.	Barn and Central Areas: Assessment and selection of feasible remedial alternative(s).	January 2002
6.	Central Area: Design of a pilot test for selected alternative(s).	February 2003
7.	Central Area: OEPA review and comment of pilot test work plan.	March 2003
8.	Central Area: Implement pilot test and assessment of results (including review with the OEPA).	April – August 2003

9.	Barn and Central Area: Design of proposed full-scale remediation program including a proposed implementation schedule.	September – November 2003
10.	Barn and Central Areas: OEPA review and comment of full scale design.	December 2003 – March 2004
11.	Barn and Central Area: Implement proposed full-scale remediation program through operation start-up.	April - July 2004

The above dates are "milestones" for tracking progress and should not be interpreted as legally enforceable deadlines. As we discussed there are many actions or events that can extend this schedule including a possible need to implement a second pilot study, if the first one doesn't provide conclusive data results. Furthermore, review and commenting periods, including those involving OEPA and PCC Airfoils, may extend beyond the times estimated to reach consensus on the selected remedial alternatives.

As you requested TRW's intent is to be as expeditious as possible, including working closely with yourself and other OEPA staff, to remediate the continuing source areas at the Minerva site, and to come to closure on this project.

Respectively,

Paul P. Jack
TRW Extended Staff Project Manager

Copy:

Mr. Robert M. Walter, TRW Legal Department
Mr. Jeff DeLaet, CDM Project Manager

CASTLE BAY, INC.

1175 William Pitt Way, Pittsburgh, Pennsylvania 15238

412-826-3277 cbay@telerama.com

Mediation • Environmental Management • Training

March 24, 2004

Ms. Vicki Deppisch
Ohio EPA
Northeast District
2110 E. Aurora Road
Twinsburg, Ohio 44087-1969

Re: Northrop Grumman (formerly TRW, Inc) Minerva Site – ID # 276-0827
Amendment to Groundwater Work Plan

Dear Ms. Deppisch,

Submitted in a letter dated August 8, 2002 was a proposed amendment to the Ground Water Work Plan for the Minerva site outlining TRW's proposed plan and schedule for implementation of the corrective actions described. Findings from site and photo investigations of the Central Area in 2003 have extended that plan and schedule necessitating additional interim investigations in 2004. The following is an updated plan and schedule.

	Scope of Work Item	Target Due Date
1.	Barn Area: Conduct reconnaissance of barn interior and assessment of past hazardous materials management practices.	Completed
2.	Barn Area: Design site investigation program to obtain information for assessment of remedial alternatives.	Completed
3.	Barn Area: OEPA and PCC Airfoils review and comment of investigation program.	Completed
4.	Barn Area: Implement investigation program. Included in this investigation was an auxiliary assessment of the Central Area near the building, an internal assessment of remedial options in the Central Area, followed by a historical photo assessment of past operations.	Completed – August 2003
5.	Central Area - Implement an auxiliary investigation program near the main plant building, an internal assessment of remedial options in the Central Area, followed by a historical photo assessment of past operations.	Completed – February 2004

6.	Central Area – Prepare and implement an investigation of the northeast extension or the wax ditch and south pond area, and collects samples for bench scale study	April - May 2004
7.	Central Area – Complete bench scale study.	May 2004
8.	Barn and Central Areas: Assessment and selection of feasible remedial alternative(s).	June 2004
9.	Central Area: Design of a pilot test for selected alternative(s).	July 2004
10.	Central Area: OEPA review and comment of pilot test work plan.	July 2004
11.	Central Area: Implement pilot test and assessment of results (including review with the OEPA).	August - December 2004
12.	Barn and Central Area: Design of proposed full-scale remediation program including a proposed implementation schedule.	January – March 2005
13.	Barn and Central Areas: OEPA review and comment of full scale design.	April - May 2005
14.	Barn and Central Area: Implement proposed full-scale remediation program through operation start-up.	June – September 2005

The above dates are "milestones" for tracking progress and should not be interpreted as legally enforceable deadlines. As we discussed there are many actions or events that can extend this schedule including a possible need to implement a second pilot study, if the first one doesn't provide conclusive data results. Furthermore, review and commenting periods, including those involving OEPA and PCC Airfoils, may extend beyond the times estimated to reach consensus on the selected remedial alternatives.

As you requested Northrop Grumman's intent is to be as expeditious as possible, including working closely with yourself and other OEPA staff, to remediate the continuing source areas at the Minerva site, and to come to closure on this project.

Respectively,

Paul P. Jack
Project Manager

CASTLE BAY, INC.

1175 William Pitt Way, Pittsburgh, Pennsylvania 15238

412-826-3277 cbay@telerama.com

Mediation • Environmental Management • Training

Electronic mail

May 04, 2005

Vicki Deppisch
Ohio EPA
Northeast District office
2110 East Aurora Road
Twinsburg, Ohio 44087

Subject: Minerva Site
Source Area Investigations

Dear Ms. Deppisch,

This is in response to your email dated April 15, 2005 requesting a summary report of the additional source area investigative (SAI) work that has been conducted at the Minerva site. As we discussed, you would like to include this information in the 3rd "Five-Year Review" which you are preparing.

The additional SAI work was initiated following the 2nd Five-Year Report (CDM, March 2000), which noted that the groundwater concentrations have remained stable throughout much of the extraction system operation. The Report concluded that a continuing residual contaminant mass may exist in the Central Area. The initial SAI activities prompted by this conclusion include the following:

Date	Activity	Conclusion
2001, May	Investigation to screen selected locations of the Central Area for indications of a continuing residual mass.	Residual volatile organic compounds (VOCs) are present primarily within the capillary fringe and saturated zone below area of the former Wax Ditch and former South Pond.
2001, October	Investigation to further delineate for the presence of site-contaminant "source area(s)" in the Central Area.	The uppermost deposits (i.e., unsaturated zone) do not appear to be the source of VOCs recharging the groundwater. The highest VOC concentration in groundwater occurs in the top 5 - 10 feet of the saturated zone (or 15 feet bgs) within or in close proximity of the former wax ditch area.

2002. November	Investigation for the collection of additional field data within the Central Area needed for assessing key design parameters related to possible remedial alternatives.	The contaminated groundwater flowed freely; no wax material was visibly present; PCBs were present in some samples;

Following these activities, in August 2003 and again in April-May and November 2004, additional SAI work took place to assess better the vertical and horizontal extent in the Central Area and the Barn Area. Attached are six Figures developed from information obtained from the 2004 SAI work. These depict the estimated TCE distribution in the soils at both the Barn and Central Areas.

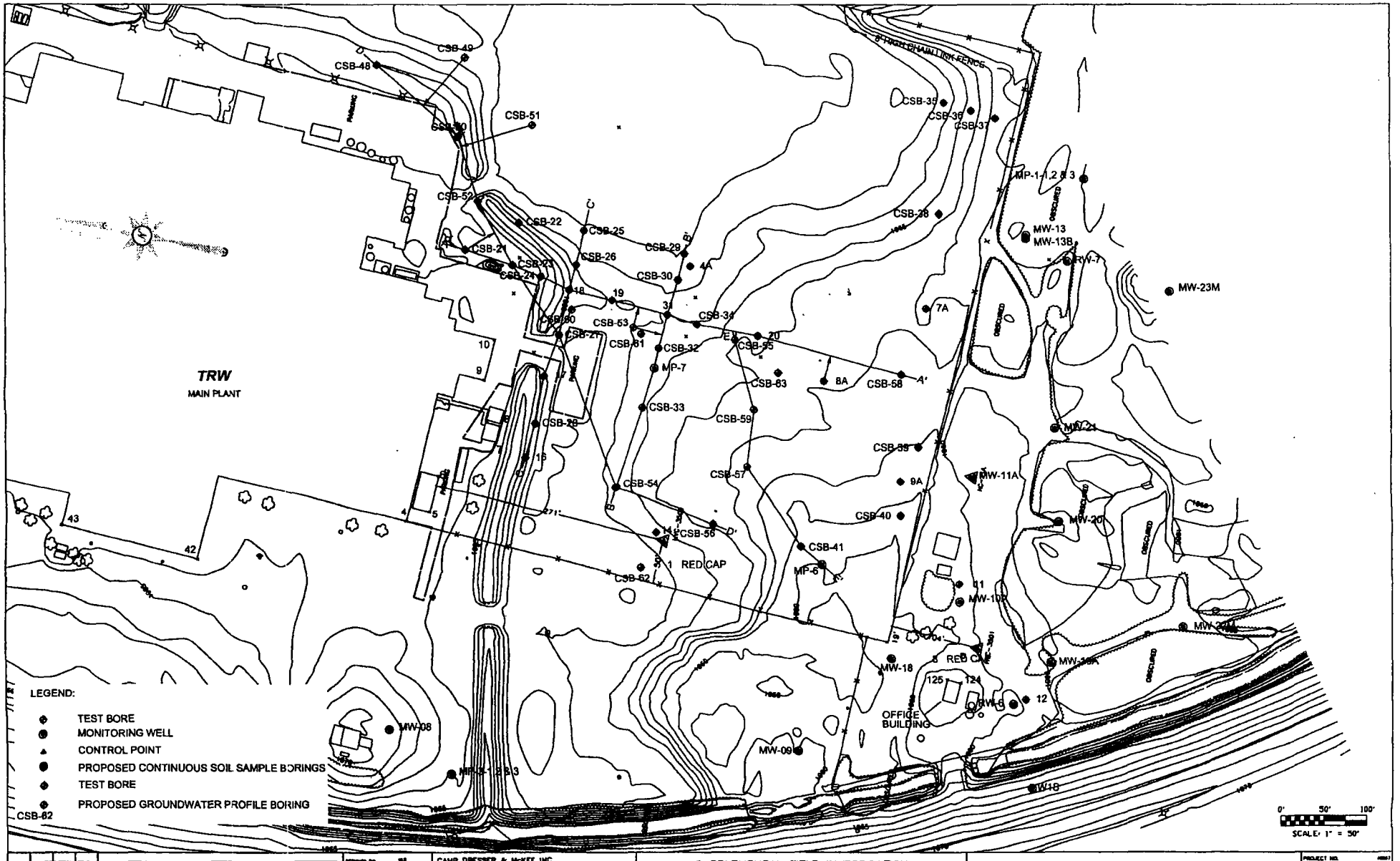
After evaluating the data from the work performed through 2004, we have concluded that additional SAI work must be done to define adequately the extent of the source area. We plan to continue the SAI work in both the Barn and Central Areas through the Summer 2005.

Please let me know if you would like to discuss this further or require additional information for your report.

Sincerely.

Castle Bay Inc.

Paul P. Jack



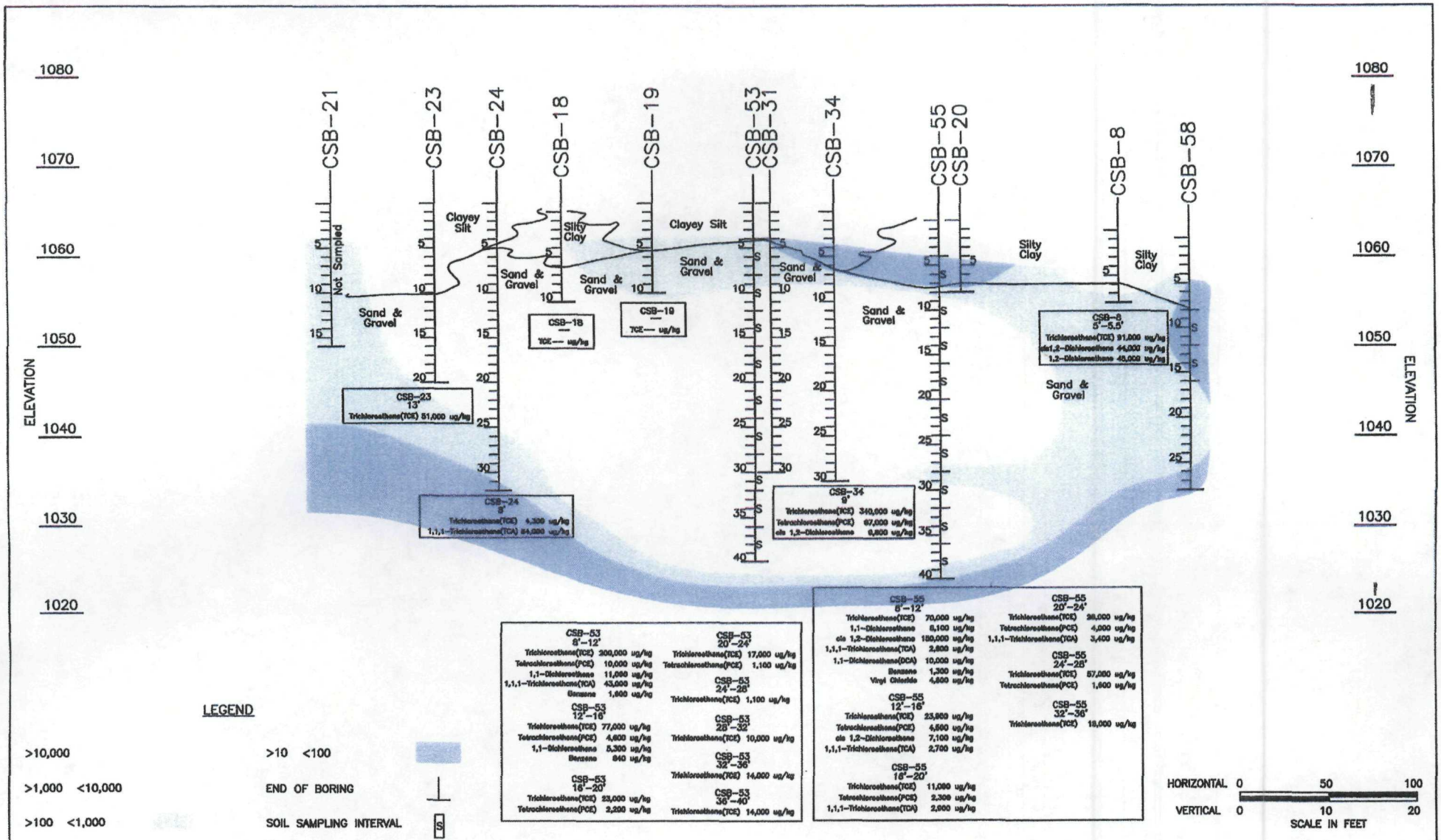
CAMP DRESSER & McKEE INC.

CDM

SUPPLEMENTAL FIELD INVESTIGATION
FORMER TRW SITE
MINERVA, OHIO
MAY, 2004

CROSS SECTION
PLAN VIEW

FIGURE 6-1



REV. NO.	DATE	DRAWN	CHKD	REMARKS

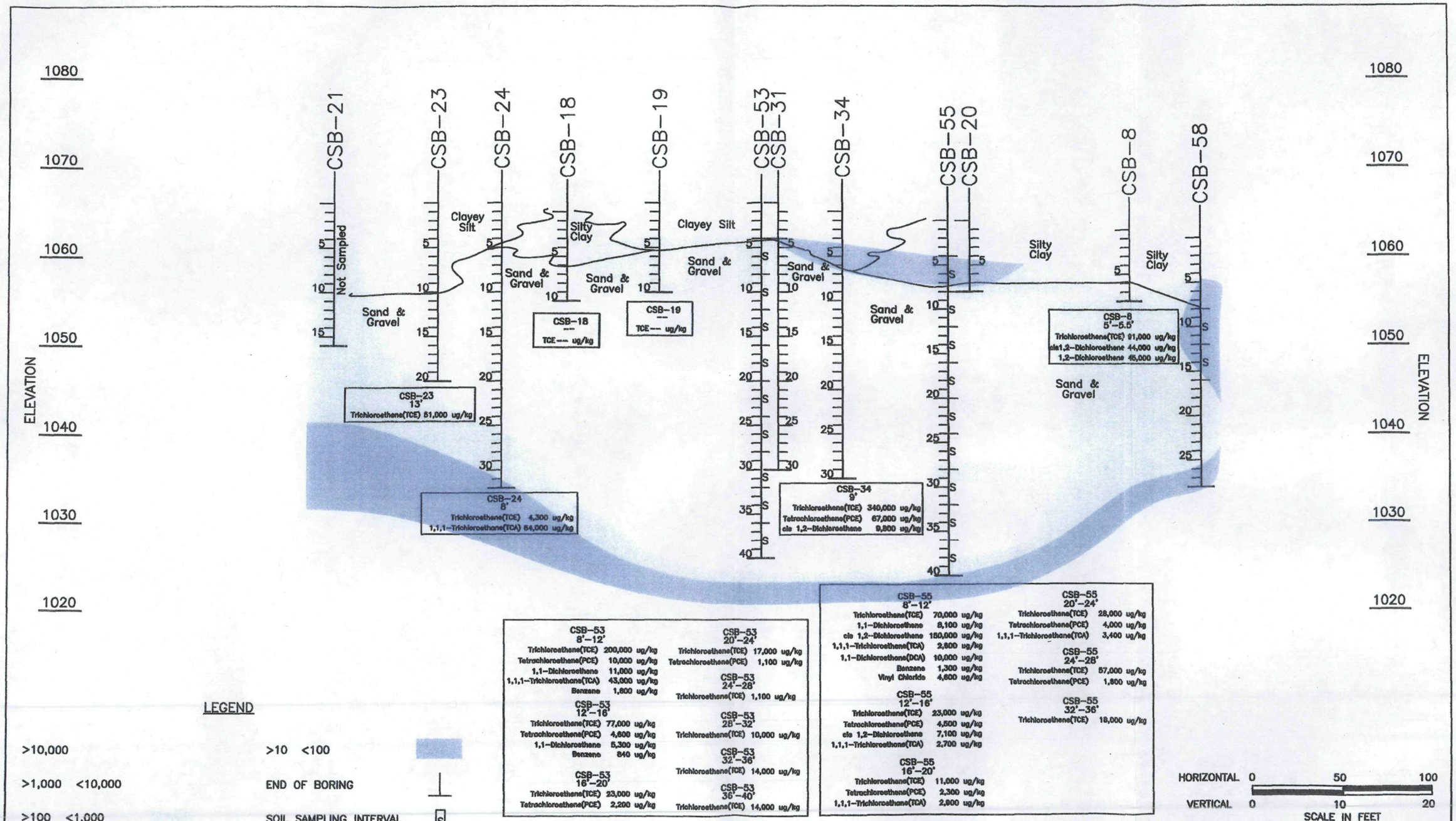
CAMP DRESSER & McKEE INC.

CDM

SUPPLEMENTAL FIELD INVESTIGATION
FORMER TRW SITE
MINERVA, OHIO
MAY, 2004

ESTIMATED TCE DISTRIBUTION IN SOILS CROSS SECTION A–A'

FIGURE 6-16



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: WLB
DRAWN BY: MRH
SHEET CHK'D BY: WLB
CROSS CHK'D BY:
APPROVED BY: WLB
DATE: 1-04-05

CAMP DRESSER & McKEE INC.

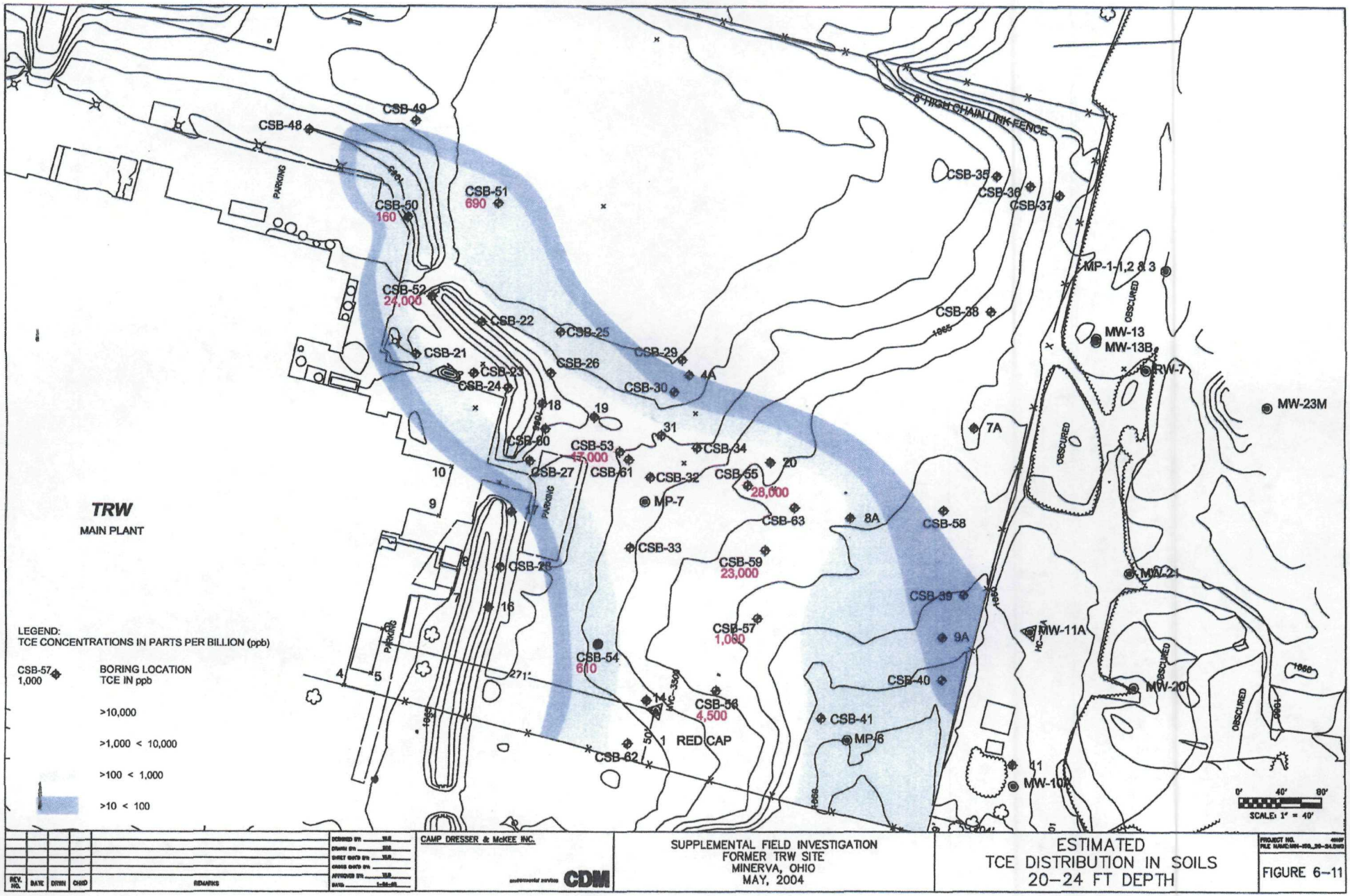
environmental services CDM

SUPPLEMENTAL FIELD INVESTIGATION
FORMER TRW SITE
MINERVA, OHIO
MAY, 2004

ESTIMATED TCE DISTRIBUTION IN SOILS CROSS SECTION A-A'

PROJECT NO. 40087
FILE NAME: MIN-XSECAA.DWG

FIGURE 6-16



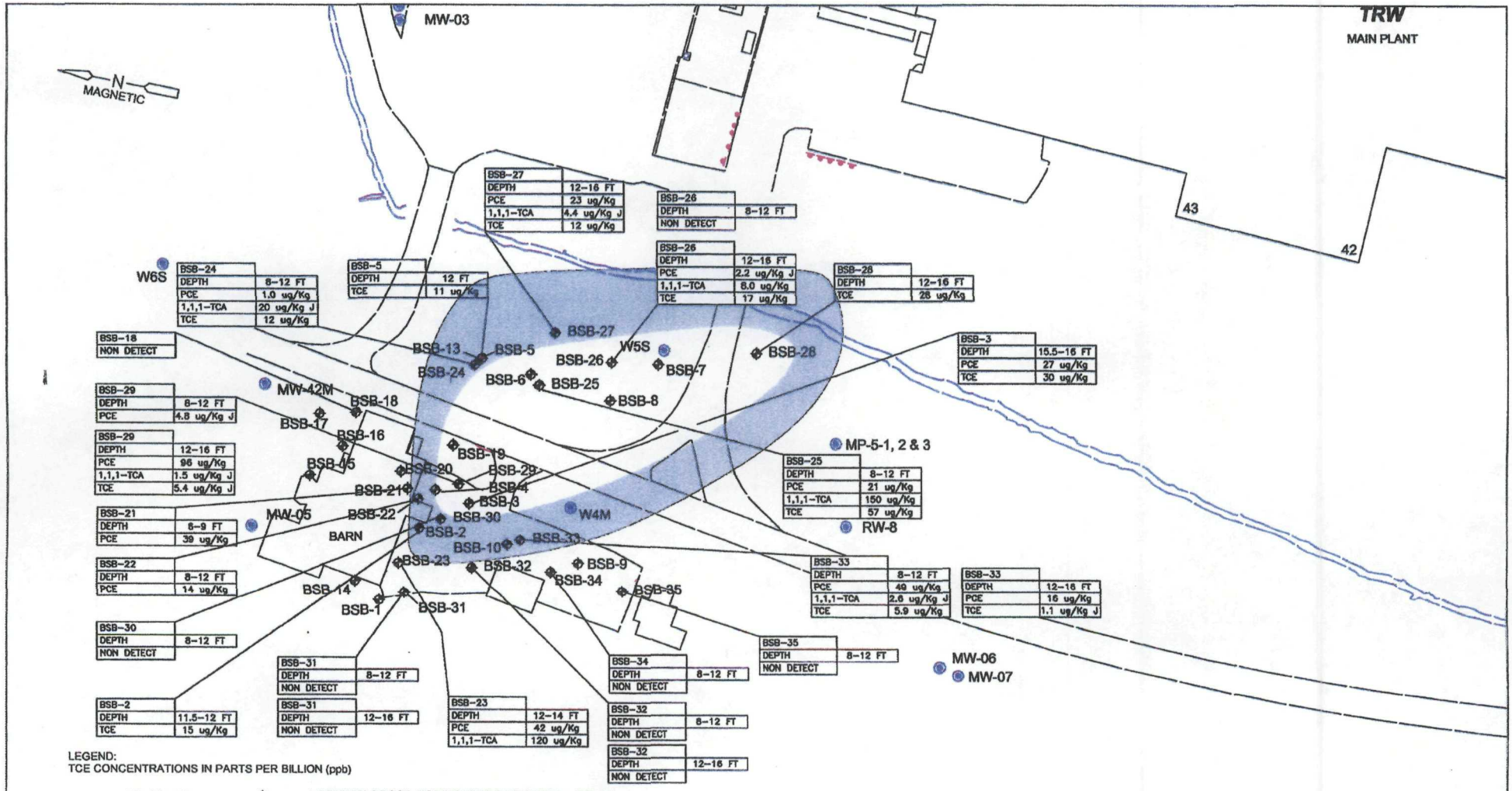
REV. NO.	DATE	DRWN	CHKD	REMARKS

CAMP DRESSER & McKEE INC.
environmental services CDM

SUPPLEMENTAL FIELD INVESTIGATION
FORMER TRW SITE
MINERVA, OHIO
MAY, 2004

ESTIMATED
TCE DISTRIBUTION IN SOILS
20–24 FT DEPTH

FIGURE 6–11



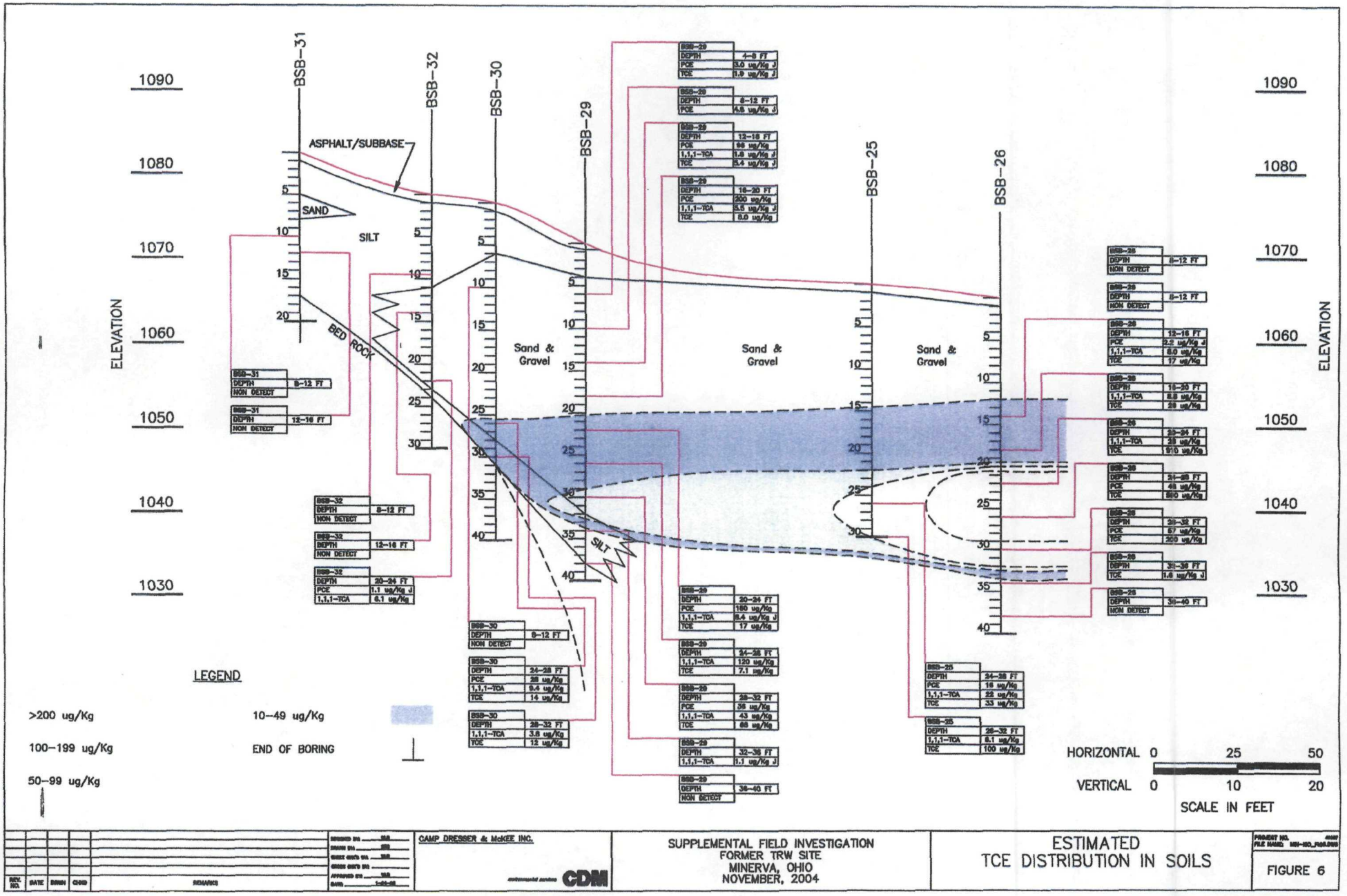
REV. NO.	DATE	DRWN	CHKD	REMARKS

CAMP DRESSER & McKEE INC.
environmental services CDM

SUPPLEMENTAL FIELD INVESTIGATION
FORMER TRW SITE
MINERVA, OHIO
NOVEMBER, 2004

ESTIMATED TCE DISTRIBUTION IN SOILS 8–16 FT DEPTH

FIGURE 2

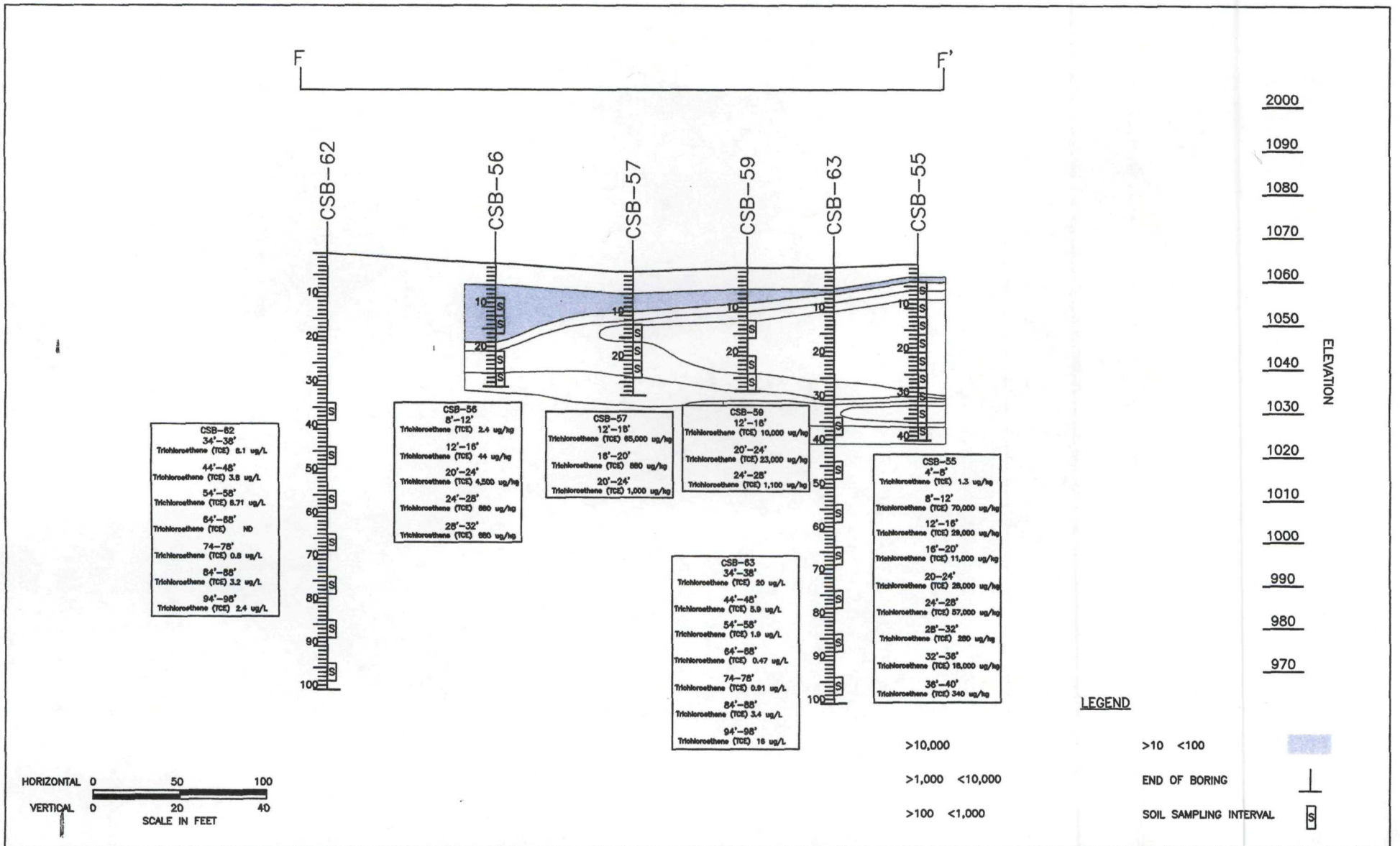


CAMP DRESSER & McKEE INC.

SUPPLEMENTAL FIELD INVESTIGATION
FORMER TRW SITE
MINERVA, OHIO
NOVEMBER, 2004

ESTIMATED
TCE DISTRIBUTION IN SOILS

FIGURE 6



REV. NO.	DATE	BY/IN	CHKD	REMARKS

CAMP DRESSER & McKEE INC.

environmental services CDM

SUPPLEMENTAL FIELD INVESTIGATION
FORMER TRW SITE
MINERVA, OHIO
MAY, 2004

ESTIMATED TCE DISTRIBUTION IN SOILS CROSS SECTION F-F'

FIGURE 6-18

APPENDIX B

Village of Minerva Residential Well Survey
Responders

Owner	Address	Residential/ Commercial Property	Use as Indicated by Owner	City of Minerva Questionnaire Sent (Y/N)	Additional Well Construction Information	Well on Property	Well in Use	Well in Use for Drinking Water
Brian Willis 330-868-7891	300 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Steve Jackson 330-868-4770	303 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Bryan Sayers	305 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Arthur J. Shilling 330-806-6036	404 Almeda	Residential	Connected to City Water Supply.	Y		N	N	N
Kathryn Mease 868-4320	405 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Shealee Mitchell & Carole Ray 330-868-4302	406 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Diane Kupfer	407 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Stanley N. Watts	408 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Annette Rinehart 330-868-0048	410 Almeda	Residential	Connected to City Water Supply. No well	Y		N	N	N
Rodney Brown 330-868-4489	16424 Delmar Drive	Residential	Connection to City Water Supply	Y	Well covered over with concrete when porch was built & garage enlarged.	*N	N	N
Richard Reed	16440 Delmar Drive	Residential	Connected to City Water Supply.	Y	Opening in front yard.	Y	N	N
Walt Miller	16464 Delmar Drive	Residential	Connected to City Water Supply. Also used for watering lawns	Y	Shallow - not really sure. Tested - good quality for iron	Y	Y	N
Steve Osborne	16480-16486 Delmar	Residential	Connected to City Water Supply. No well	Y		N	N	N
Mrs. Dean Moore	16492 Delmar Drive	Residential	Connected to City Water Supply. Not sure where well is.	Y		Y	N	N
Mike Russo	16515 Delmar Drive	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Zeiger	16516 Delmar Drive	Residential	Connected to City Water Supply	Y	Might be well in back. Not in use.	*N	N	N

Project (P):Northrop Grumman/Minerva 40967/Residential Well Survey/Well Survey Table
*N - well abandoned, capped, covered, or not sure

October 11, 2004
Revised March 22, 2005

Village of Minerva Residential Well Survey
Responders

Mike Russo	16517 Delmar Drive	Residential	Connected to City Water Supply	Y		*N	N	N
Sue Obney	16535 Delmar Drive	Residential	Connected to City Water Supply.	Y		Y	N	N
Richard Croford	16538 Delmar Drive	Residential	Well abandoned. Connected to City Water Supply	Y		*N	N	N
Natalie Everett	210 Don Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Kisha Kupfer	210-1/2 Don Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Debbie Dourm 330-868-0267	212 Don Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Carole Carle	214 Don Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Linda Burns	612 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Sue Wackerly 330-868-9966	614 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Shelby J. Truxall 330-868-5138	616 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Richard & Moinell Snyder 330-868-5350	620 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Jeff Jones 330-868-6124	700 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Alan French 330-868-6279	702 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
James Smith	704 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Ronald Wheatley	705 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Robert Murray	706 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Velazquez	707 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Harry Duvall	709 E. First St.	Residential	Connected to City Water Supply and has a well	Y	Mr. Duvall did not want to answer questions regarding his well	Y	?	?
Marla Arnold 330-868-3714	710 E. First St.	Residential	Connected to City Water Supply	Y	Old well in basement. Has not been used in 14 years.	Y	N	N

Project (P):Northrop Grumman/Minerva 40967/Residential Well Survey/Well Survey Table
*N - well abandoned, capped, covered, or not sure

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Village of Minerva Residential Well Survey
Responders

D. Aquino	713 E. First St.	Residential	Connected to City Water Supply. Don't use well. Capped off.	Y		*N	N	N
Ron A. Konieco 330 868-9991	714 E. First St.	Residential	Connected to City Water Supply	Y	Well capped. Not in use.	*N	N	N
Shawn Coe 330-868-6554	715 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Michael L.& Angela Kerr	717 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Shawn Carle/(Clapper) 330-868-0442	718 E. First St.	Residential	Connected to City Water Supply	Y	Well but unsure of its purpose.	Y	N	N
Lebert Wise	727 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Dorothy Jenkins 330-868-5593	730 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Tarbet Harris 330 868-5368	738 E. First St.	Residential	Connected to City Water Supply	Y	Well was driven, pump removed, pipe pulled	*N	N	N
Ron A. Konieco 330-868-9991	739 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Laren Hein	742 E. First St.	Residential	Connected to City Water Supply	Y	Been connected to city water for 34 years.	Y	N	N
Beverly/Charles Lumley 330-868-3146	746 E. First St.	Residential	Do not have a well.	Y		N	N	N
Ron A. Konieco 330-868-9991	747 E. First St.	Residential	Used for drinking. Well water with city sewer	Y	Well is on east side of house.	Y	Y	Y
Darren Zwick	754 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Larry D. Simms 330-868-6935	755 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Binford Eubank 330-868-4508	800 E. First St.	Residential	Connected to City Water Supply	Y	Well was capped in 1961	Y	N	N
Steve Valentik 330 868-6793	801 E. First St.	Residential	Connected to City Water Supply	Y	Haven't used for 10 years. Well located in basement.	Y	N	N
Bruce Shafer	805 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Geraldine Ridgeway	808 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Michael Hodge	809 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N

Village of Minerva Residential Well Survey
Responders

James Smith 330-868-5126	820 E. First St.	Residential	Connected to City Water Supply	Y	I have a pipe with no pump. Have never tried to use it.	Y	N	N
Jenny Corbitt	900 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Lynda Spears	902 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Donene Markel	906 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mack Hein 330-868-7594	908 E. First St.	Residential	Connected to City Water Supply. Used for gardening & car washing.	Y	25' deep. Easy access. Well in basement.	Y	Y	N
Verna Wadsworth 330-868-5455	913 E. First St.	Residential	Connected to City Water Supply. Used for water lawn/flowers.	Y		Y	Y	N
Edward Davison 330-868-4434	916 E. First St.	Residential	Used for cooking, laundry, bathing but not drinking.	Y	House & well built in 1958.	Y	Y	N
Jeff Betler 330-868-1446	920 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Earl E. Stump 330-868-6944	921 E. First St.	Residential	Uses well for everything.	Y	Shallow well.	Y	Y	Y
Donald Mutigli 330-868-6451	925 E. First St.	Residential	Connected to City Water Supply	Y	Well abandoned. See attachments (lab tests)	*N	N	N
Janet White 330-868-5639	928 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Roberta Walter 330-868-4529	931 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Robert & Linda Crouse 330-868-3161	935 E. Frist St.	Residential	Connected to City Water Supply. Well water used for drinking.	Y		Y	Y	Y
Edward Evans 330-868-1359	936 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Joyce Severn 330-868-3431	940 E. First St.	Residential	Connected to City Water Supply	Y	Property is owned by Lorena Vandergrift.	N	N	N
Lois Marshall 330-868-6287	1000 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N
Gerald Rose 330-868-3399	1005 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Geraldine Fry 330-868-5185	1012 E. First St.	Residential	Connected to City Water Supply	Y		N	N	N

Village of Minerva Residential Well Survey
Responders

Sherril Skaggs 330-868-5000	1017 E. First St.	Residential	Connected to City Water Supply	Y	No. Converted over prior to home ownership in 1996. Well located basement- Do not use.	Y	N	N
Gladys Stryffeler 330-868-4949	1024 E. First St.	Residential	Connected to City Water Supply	Y	Have not used well for many years.	*N	N	N
Diane Linhart	1032 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Richard & Beverly Fry	1044 E. First St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Hank McClellan (Fire Chief)	505 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Wicked Tatooz - Scott (Owner)	507 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Kexiu - China House	509 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Denise Kirven	604 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Donna Hafer/Consumers National Bank	606 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Minerva Dairy Queen 330-868-6104	613 E. Lincoln Way	Commercial	Connected to City Water Supply	Y		N	N	N
Consumers National Bank	614 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y	No known wells per Donna Kandel.	N	N	N
Dorothy Clark	615 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Jerrie Homan	617 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Elizabeth Pratt	619 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Citi Financial	620 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y	Talked w/employee, not property owner	N	N	N
Mrs. Roy Blevins	621 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Sky Bank	622 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Hazel McCrobia (Speedway SuperAmerica)	625 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N

Village of Minerva Residential Well Survey
Responders

Joe Elliott	628 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Gregory Mills	629 E. Lincoln Way	Residential	Connected to City Water Supply.	Y	Can't get to it. Cemented over it years ago.	*N	N	N
Betty McClellan 330-868-3573	700 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
(previously Tim/Karla Reynolds)	701 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Vern Wadsworth 330-868-5726 or 5051	702 E. Lincoln Way	Residential	Connected to City Water Supply. Outdoor use only.	Y	Well in Basement.	Y	Y	N
Mrs. Christopher	703 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Ken Green	705 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Janice Roach	706 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Floyd Speelman 330-868-7730	707 E. Lincoln Way	Residential	Connected to City Water Supply.	Y	N/A	N	N	N
Debbie Kranning (Hardee's Restaurant)	709 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Timothy N. Tarbet 330-868-7528	710 E. Lincoln Way	Residential	Connected to City Water Supply.	Y	N/A	N	N	N
Stuart Mapes (State Farm Insurance)	712 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Mandy Patterson	716 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Perry Watkins	718 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Terry & Vickie Eich 330-868-5784	720 E. Lincoln Way	Residential	Connected to City Water Supply.	Y		N	N	N
Susan Perrin	722 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Bob Nehus (Tom Klimko Auto Sales)	723 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Sue Hiner (Dairy Mart)	726 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Mabel Molan	727 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Todd Earley	729 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N

Village of Minerva Residential Well Survey
Responders

Kenneth J.Grimes	730 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Glenna Blevins	731 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Lisa Trussel (The Tanning Place/Hair and Nails)	733 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Baxter Insurance	736 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
James E. Beckley 330-868-6175	740 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Christine Beckley	742 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Wilbur Moser 330-868-3088	744 E. Lincoln Way	Residential	Connected to City Water Supply.	Y		N	N	N
Debra Cline	800 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Carol Webb	802 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mrs. Weir	804 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Doug Hosterman (Grinder's) franchise HQ's	805 E. Lincoln Way	Commercial	Connected to City Water Supply.	Y	Old abandoned well in basement.	*N	N	N
Theresa Linder	817 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mrs. Weir	820 E. Lincoln Way	Residential	Not connected to City Water Supply. Used for drinking, cleaning, restrooms, etc.	Y		Y	Y	Y
NAPA Auto Parts Tom Chilson, Manager	900 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Fraternal Order of Eagles	901 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Shades of Summer	916 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Kevin Palmer (Bowling Alley)	917 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Ron Johnson 330-868-4360	920 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Kevin Palmer (Brother)	925 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N

Village of Minerva Residential Well Survey
Responders

Kevin Palmer	929 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Phil Smith	932 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Gerry's Sleep Shop	941 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Southern Inn	948 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Minor Insurance	956 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Peacock Dry Cleaners	1002 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Minerva Car Wash / Al Overcasher, co-owner	1005 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Loudon Motors Inc. (Kris Loudon)	1007 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Jamie Miller	1012 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Brian Baumgartner	1020 E. Lincoln Way	Residential	All uses.	Y	Shallow well.	Y	Y	Y
Towpath Drive Thru/Mike Maier	1025 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Great Trail Family Practice/ Susan Barr, Owner	1028 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Rhonda Wise	1032 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Minerva Elder Care/Scott Borntrager	1035 E. Lincoln Way	Commercial	Connected to City Water Supply. No well.	Y		N	N	N
Eleanor Mason	1036 E. Lincoln Way	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Midwest Homes 330-868-7788	1041 E. Lincoln Way	Commercial	Uses well water. Not used for drinking.	Y	Well under new back office.	Y	Y	N
Hardy	730 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Gayle Carle 330-868-1030	738 Ike Street	Residential	Connected to City Water Supply. Do not use well.	Y		N	N	N
Sulin Whiteleather 330-868-3554	746 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Colloredo	800 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
James Hetrich 330-868-6394	801 Ike Street	Residential	Connected to City Water Supply. Uses for water lawn	Y		Y	Y	N

Project (P):Northrop Grumman/Minerva 40967/Residential Well Survey/Well Survey Table
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Robert Rhodes	805 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Raymond Jones	808 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Erle Gardner	812 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Cheryl Hart	817 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Margery Aller	821 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Bob Santusie	900 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Witts 330-868-1053	908 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Tyler Hollar	909 Ike Street	Residential	Connected to City Water Supply. Not known if there is a well.	Y		N	N	N
James Walker	916 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mariam Farber	917 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Eric Toalston 330-868-4897	920 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
George Kajganic 330-868-3846	921 Ike Street	Residential	Connected to City Water Supply.	Y		N	N	N
Roger Murphy	925 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Tracy Reed 330-868-1052	931 Ike Street	Residential	Connected to City Water Supply.	Y		N	N	N
Donna & Mark Betz	932 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Joe & Sue Miller	936 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Marie Lawrence	941 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mason Boldizer	945 Ike Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Harry Berry	604 Logan Street	Residential	Connected to City Water Supply. Well on property.	Y	Well has not been used for 20 years.	Y	N	N
Pat Giovanelli 330-868-5640	605 Logan Street	Residential	Connected to City Water Supply.	Y		N	N	N

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Bill Clark (Owner)	508 Lucinda	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Tim Smith	695 Lynnwood Dr.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Ron & Robin Stuckey 330-868-4378	699 Lynnwood Dr.	Residential	Connected to City Water Supply.	Y		N	N	N
Joe Hardman 330-868-0015	701 Lynnwood Dr.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Rudy & Nancy Medved 330-868-3872	704 Lynnwood Dr.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Larry & Sondra Steen 330-868-5258	4066 Marihill	Residential	Connected to City Water Supply. Only used for outside faucets only.	Y	Well is located in back of house.	Y	Y	N
William Owens	4076 Marihill	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Russell Steen	4090 Marihill	Residential	Connected to City Water Supply.	Y		N	N	N
Joe Plavka	4100 Marihill Apt. 1	Residential	Connected to City Water Supply.	Y		N	N	N
Edward Glosser	4100 Marihill Apt. 2	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Angela Young	4100 Marihill Apt. 3	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Melching 330-868-1392	4100 Marihill Apt. 4	Residential	Connected to City Water Supply.	Y		N	N	N
Don Escott	4110 Marihill Apt. 1	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Don Escott's Sister	4110 Marihill Apt. 2	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Wilfred Comtois	4113 Marihill	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Rick Stauffer	4121 Marihill	Residential	Connected to City Water Supply. Well not used.	Y	Well Abandoned, not used	*N	N	N
Dan Flickinger	4124 Marihill	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Stephanie Higgins (renter)	4126 Marihill	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Lynnette Galline	924 Miller	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Ocea Logan	725 N. Market St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N

Village of Minerva Residential Well Survey
Responders

Kimmeth Lewis	730 N. Market St.	Residential	Not connected to City Water Supply. Used for all household.	Y	Well construction not known.	Y	Y	Y
Laura Good	740 N. Market St.	Residential	Not connected to City Water Supply. Well is used for all but drinking.	Y	Not known.	Y	Y	N
Tom Wickersham 330-868-5537	901 N. Market St.	Residential	Not connected to City Water Supply. Well is used for household.	Y	25' deep.	Y	Y	Y
Tim & Pam Blackburn 330-868-6229	1021 N. Market St.	Residential	Not connected to City Water Supply. Well is used for household.	Y		Y	Y	Y
Jayne Perrin	1040 N. Market St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
H. Earl Blackburn 330-868-4545	1041 N. Market St.	Residential	Not connected to City Water Supply. Used for household.	Y	8 inch diameter casing, 50 feet deep.	Y	Y	Y
William Kertis	1066 N. Market St.	Residential	Connected to City Water Supply.	Y		N	N	N
William Kertis	1084 N. Market St.	Residential	Connected to City Water Supply. No well.	Y	Old well has not been used for 20 years.	Y	N	N
Gerald Grimes	1094 N. Market St.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Paul Kail 330-868-3878	1100 N. Market St.	Residential	Connected to City Water Supply. Well - outdoor use only.	Y	20' driven well	Y	Y	N
Homer Unkefer 330-868-6419	1105 N. Market St.	Residential	Well used for drinking.	Y	1950 - 60 foot drilled well casing.	Y	Y	Y
Greg Unkefer	1115 N. Market St.	Residential	Connected to City Water Supply.	Y		Y	N	N
Terry Green	311 Park Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Larry Pottort	400 Park Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Charles Fry	506 Park Street	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Thomas Smith II	700 Preston Ave.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Sharon Lewis	730 Shallow Run Dr.	Residential	Connected to City Water Supply. Well used for washing cars.	Y		Y	Y	N
Nadine Preston	738 Shallow Run Dr.	Residential	Connected to City Water Supply. Do not use well.	Y		N	N	N

Village of Minerva Residential Well Survey
Responders

John Wadsworth	747 Shallow Run Dr.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Donna Zwahlen	800 Shallow Run Dr.	Residential	Connected to City Water Supply.	Y		*N	N	N
David Casper	805 Shallow Run Dr.	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Carl Jacobsen	812 Shallow Run Dr.	Residential	Connected to City Water Supply. Well used for gardening & outdoor use.	Y		Y	Y	N
Glenda Drews	900 Shallow Run Dr.	Residential	Connected to City Water Supply. No well.	Y	No wells on property other than 2 test wells	N	N	N
Edward Hafer	407 Stadium	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Joseph Pharis	409 Stadium	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Angela Riddle	501 Stadium	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Beverly Scott	503 Stadium	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Todd Stuckey	505 Stadium	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Carol Hudson	603 Stadium	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Harold Monk 330-868-4829	605 Stadium	Residential	Connected to City Water Supply. No well.	Y		N	N	N
David Beatnel	607 Stadium	Residential	Connected to City Water Supply. Do not use well.	Y		Y	N	N
William Rine 330-868-3545	742 Stafford	Residential	Connected to City Water Supply.	Y		N	N	N
Paul Wingert	743 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Joseph Wilson 330-868-5036	747 Stafford	Residential	Connected to City Water Supply	Y		N	N	N
Marjorie Noling	750 Stafford	Residential	Connected to City Water Supply	Y		N	N	N
Joanne Zwahlen	800 Stafford	Residential	Connected to City Water Supply	Y		N	N	N
Alice Johnson	804 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Betty White	805 Stafford	Residential	Connected to City Water Supply. Well used for outdoor use, summer only.	Y	Well is backyard next to pool, approx. 23 feet deep.	Y	Y	N

Village of Minerva Residential Well Survey
Responders

Harold Moore	809 Stafford	Residential	Connected to City Water Supply. Only used for car washing.	Y		Y	Y	N
Edna Flick	813 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Jamie Evans	817 Stafford	Residential	Don't know.	Y	Just moved in 2 weeks ago.	N	N	N
Edna Trussel	820 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Ralph Norman	900 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mrs. John A. Shirley	901 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Paul Carson	908 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Luther Stack	909 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Bonnie Keller	916 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
would not provide	917 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
John Lane	924 Stafford	Residential	Connected to City Water Supply.	Y		*N	N	N
Michael Pietrafese	925 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mike Synclair	928 Stafford	Residential	Connected to City Water Supply. Not aware of well.	Y		N	N	N
Doris Bettis	929 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Alva Suder	932 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Barry & Vicki Welch 330-868-4800	937 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
David Morris	940 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Mrs. Larry Miller	941 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
William Swinger	948 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Thomas G. Marcinkowey 330-868-5512	949 Stafford	Residential	Connected to City Water Supply.	Y	Well in basement.	Y	N	N

Village of Minerva Residential Well Survey
Responders

Norman Stanford	956 Stafford	Residential	Connected to City Water Supply.	Y		*N	N	N
Rijchard Draher	957 Stafford	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Ashley Horning	1000 Stafford	Residential	Connected to City Water Supply. Well used for outdoor use.	Y		Y	Y	N
Scott Russell	1004 Stafford	Residential	Connected to City Water Supply. Well used for outdoor use.	Y		Y	Y	N
Barbara Hochstetler	504 Superior	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Barbara Hochstetler	506 Superior	Residential	Connected to City Water Supply. No well.	Y		N	N	N
Barbara Hochstetler	508 Superior	Residential	Connected to City Water Supply. No well.	Y		N	N	N

Notes:

* Indicates uncertainty. Well form was returned but no indication of whether or not a well is on the property. An indication of using city water supply does not necessarily indicate no well or no well property.

Some residents indicated that they did not want their well sampled.

Village of Minerva Residential Well Survey
Well Owners

MAP #	Owner	Address	Residential/ Commercial Property	Use as Indicated by Owner	City of Minerva Questionnaire Sent?	Additional Well Construction Information	Well on Property?	Well in Use?	Well Used for Drinking Water?
1	Richard Reed	16440 Delmar Drive	Residential	Connected to Village Water Supply	Y		Y	N	N
2	Walt Miller	16464 Delmar Drive	Residential	Connected to Village Water Supply. Well is used for watering lawn.	Y	Shallow - not really sure. Tested - good quality high for iron.	Y	Y	N
3	Dean Moore	16492 Delmar Drive	Residential	Connected to Village Water Supply. Well is not used.	Y		Y	N	N
4	Sue Obney	16535 Delmar Drive	Residential	Connected to Village Water Supply	Y		Y	N	N
5	Harry Duvall	709 E. First St.	Residential	Connected to Village Water Supply. Mr. Duvall did not want to answer any further questions regarding the well.	Y		Y	?	?
35	Marla Arnold	710 E. First St.	Residential	Connected to Village Water Supply.	Y	Old well in basement. Has not been used in 14 years.	Y	N	N

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Village of Minerva Residential Well Survey
Well Owners

37	Shawn Carle/(Clapper)	718 E. First St.	Residential	Connected to Village Water Supply.	Y	Well but unsure of its purpose.	Y	N	N
6	Laren Hein	742 E. First St.	Residential	Connected to Village Water Supply.	Y		Y	N	N
7	Ron A. Konieco 330-868-9991	747 E. First St.	Residential	Used for drinking. Well water with city sewer	Y		Y	Y	Y
8	Steve Valentik	801 E. First St.	Residential	Connected to Village Water Supply.	Y	Haven't used well for 10 years. Well located In basement.	Y	N	N
36	James Smith	820 E. First St.	Residential	Connected to Village Water Supply.	Y	Have pipe with no pump. Have never tried to use it.	Y	N	N
9	Mack Hein 330-868-7594	908 E. First St.	Residential	Connected to Village Water Supply. Used for gardening & car washing.	Y	25' deep. Easy access. Well in basement.	Y	Y	N
10	Verna Wadsworth	913 E. First St.	Residential	Connected to Village Water Supply. Used for water lawn/flowers.	Y		Y	Y	N

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Village of Minerva Residential Well Survey
Well Owners

11	Edward Davison	916 E. First St.	Residential	Used for cooking, laundry, bathing but not drinking.	Y	House & well built in 1958.	Y	Y	N
12	Earl E. Stump 330-868-6944	921 E. First St.	Residential	Uses well for everything.	Y	Shallow well.	Y	Y	Y
13	Robert & Linda Crouse 330-868-3161	935 E. First St.	Residential	Connected to Village Water Supply. Well water used for drinking.	Y		Y	Y	Y
38	Sherril Skaggs	1017 E. First St.	Residential	Connected to Village Water Supply.	Y	Converted over prior to home ownership in 1996. Well located basement- Do not	Y	N	N
14	Gregory Mills	629 E. Lincoln Way	Residential	Connected to Village Water Supply. Well is cemented over.	Y		Y	N	N
15	Vern Wadsworth 330-868-5726 or 5051	702 E. Lincoln Way	Residential	Connected to Village Water Supply. Outdoor use only.	Y	Well in Basement.	Y	Y	N
16	Mrs. Weir	820 E. Lincoln Way	Residential	Not connected to Village Water Supply. Used for drinking, cleaning, restrooms, etc.	Y		Y	Y	Y
17	Brian Baumgartner	1020 E. Lincoln Way	Residential	All uses.	Y	Shallow well.	Y	Y	Y
18	Midwest Homes 330-868-7788	1041 E. Lincoln Way	Commercial	Uses well water. Not used for drinking.	Y	Well under new back office.	Y	Y	N

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Village of Minerva Residential Well Survey
Well Owners

19	James Hetrick 330-868-6394	801 Ike Street	Residential	Connected to Village Water Supply. Uses for water lawn	Y		Y	Y	N
39	Harry Berry	604 Logan Street	Residential	Connected to Village Water Supply.	Y	Well has not been used for 20 years.	Y	N	N
20	Larry & Sondra Steen 330-868-5258	4066 Marihill	Residential	Connected to Village Water Supply. Only used for outside faucets only.	Y	Well is located in back of house.	Y	Y	N
21	Kenneth Lewis	730 N. Market St.	Residential	Not connected to Village Water Supply. Used for all household.	Y	Not known.	Y	Y	Y
22	Laura Good	740 N. Market St.	Residential	Not connected to Village Water Supply. Well is used for all but drinking.	Y	Not known.	Y	Y	N
23	Tom Wickersham 330-868-5537	901 N. Market St.	Residential	Not connected to Village Water Supply. Well is used for household.	Y	25' deep.	Y	Y	Y
24	Tim and Pam Blackburn 330-868-6229	1021 N. Market St.	Residential	Not connected to Village Water Supply. Used for household.	Y		Y	Y	Y
25	H. Earl Blackburn 330-868-4545	1041 N. Market St.	Residential	Not connected to Village Water Supply. Used for household.	Y	8 inch diameter casing, 50 feet deep.	Y	Y	Y

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Village of Minerva Residential Well Survey
Non-Responders

Owner	Telephone Area Code (330)	Address	Residential/ Commercial Property	Initial Well Survey Questionnaire Left 5/24-25/04	Telephone Call 8/27-31/04	Telephone Call 9/13-14/04	Follow- up Questionnaire Left 9/19/04	Follow-up Telephone Call or Site Visit and Interview 10/04-1/05	Follow- up Questionnaire
Carolyn A. Bugh	868-0574	933 E. First	Resi-Duplex	Y	2	2	Y	2	N
vacant		904 E. First	Resi-Quad	Y	N	N	N (vacant)	N	N
Tracey Bell (disconnect)	868-2623	734 E. First	Residential	Y	N	N	Y	N	N
Kelly Critean	868-9806	701 E. First	Residential	Y	2	2	Y	2	N
Jeff Hughes - Owner (disconnect)	868-5714	402 Almeda	Residential	Y	N	N	Y	N	N
Nancy Larson		301 Almeda	Duplex	Y	N	N	Y (vacant)	N	N
?		301 1/2 Almeda	Duplex	Y	N	N	Y	N	N
Mary Ellen Brown	868-3185	507 Stadium	Residential	Y	1	1	Y	1	N
Consumer National Bank		608 E. Lincoln Way	Residential	Y	N	N	Y (vacant)	N	N
Jessica Manbeck	868-7382	1000 E. Lincoln Way	Residential	Y	N	N	Y	2	N
Debbie Dourm	868-0267	212 Don Street	Duplex	Y	2	2	Y	2	N

Telephone call key:
1 = called, no answer, no answering machine
2 = called, no answer, left message on answering machine
3 = called, spoke with resident

Village of Minerva Residential Well Survey
Well Owners

40	William Kertes	1084 N. Market St.	Residential	Connected to Village Water Supply.	Y	Old well has not been used for 20 years.	Y	N	N
26	Paul Kail	1100 N. Market St.	Residential	Connected to Village Water Supply. Well is for outdoor use only.	Y	20' driven well	Y	Y	N
27	Homer Unkefer 330-868-6419	1105 N. Market St.	Residential	Well used for drinking.	Y	1950 - 60 foot drilled well casing.	Y	Y	Y
28	Unkefer Equipment	1115 N.Market St.	Commercial	Not connected to Village Water Supply. Well used for everything	Y		Y	Y	Y
29	Sharon Lewis	730 Shallow Run Dr.	Residential	Connected to Village Water Supply. Well used for washing cars.	Y		Y	Y	N
30	Carl Jacobsen	812 Shallow Run Dr.	Residential	Connected to Village Water Supply. Well used for gardening & outdoor use.	Y		Y	Y	N
41	David Beadnell	607 Stadium	Residential	Connected to Village Water Supply.	Y		Y	N	N
31	Betty White	805 Stafford	Residential	Connected to Village Water Supply. Well used for outdoor use, summer only.	Y	Well is backyard next to pool, approx. 23 feet deep.	Y	Y	N

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Village of Minerva Residential Well Survey
Well Owners

32	Harold Moore	809 Stafford	Residential	Connected to Village Water Supply. Well is only used for car washing.	Y		Y	Y	N
42	Thomas Marcinkowey	949 Stafford	Residential	Connected to Village Water Supply.	Y	Well in Basement.	Y	N	N
33	Ashley Horning	1000 Stafford	Residential	Connected to Village Water Supply. Well used for outdoor use.	Y		Y	Y	N
34	Scott Russell	1004 Stafford	Residential	Connected to Village Water Supply. Well used for outdoor use.	Y		Y	Y	N

LEGEND-CORRESPONDING TO RESIDENTIAL WELL SURVEY MAP

Red Dot — **Well used for drinking or indoor use**

Yellow Dot — **Well used for outdoor purposes (gardening, car washing, pool, etc.)**

Green Dot — **Well not used**

Blue Dot — **Well abandoned, capped, covered, not sure**

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TRW Minerva

LEGEND

- WELL USED FOR DRINKING OR INDOOR USE
- WELL USED FOR OUTDOOR PURPOSES (GARDENING, CAR WASHING, POOL, ETC.)
- WELL NOT USED
- WATERLINE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: S. CARUSO
SHEET CHK'D BY: V. BARNER
CROSS CHK'D BY:
APPROVED BY:
DATE: 10/13/04

CDM Camp Dresser & McKee
creating engineering solutions
2740 SMALLMAN STREET, SUITE 100
PITTSBURGH, PENNSYLVANIA 15222
TEL: 412-201-5500 FAX: 412-201-5522

COMPILATION OF RESIDENTIAL WATER WELLS AND VILLAGE OF MINERVA WATERLINES

RESIDENTIAL WELL SURVEY

PROJECT NO. 23580-48967
FILE NAME: RESIDENTIAL WELLS
SHEET NO.

C:\Residential Wells8.dgn 11/4/2004 11:37:16 AM

APPENDIX C

SECURE CELL ORDER

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: TRW MINERVA	**Date of inspection:** 11/10/04, 10/13/04, 4/14/05
Location and Region: MINERVA, OH Region 5	**EPA ID:** OHD 004179339
Agency, office, or company leading the five-year review: OHIO EPA NEDO	**Weather/temperature:** 60's-70's, PARTLY CLOUDY

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- G Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other LEACHATE COLLECTION SYSTEM LYSIMETERS (CLOGGED)
- G Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** STEVE NELSON (Name) SITE OPERATOR (Title) 11/10/04, 10/13/04, 4/14/05 (Date)
   Interviewed G at site G at office G by phone Phone no. 330-868-4370
   Problems, suggestions; G Report attached Conducts routine maintenance, including GW monitoring wells

2. **O&M staff** NONE (Name) _____ (Title) _____ (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

Mr. Nelson reports to the Independent Project Manager, Paul Jack, Castle Bay Inc., Pittsburgh, PA. 412-826-3277

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency USEPA / PCB DIVN. Region 5
Contact Steve Jonnser — Project Manager — 12/6/04 — 312-886-1330
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached
Regulatory authority over PCBs

Agency Bill Franks-Stark
Contact County Health Dept — Health Coord. — 12/04 — 330-493-9704
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached

Agency USEPA Region 5
Contact Greg Beard — Proj. manager — ____ — 312-886-7253
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached

Agency ____
Contact ____ — ____ — ____ — ____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — (G) Readily available — G Up to date — G N/A
   - G As-built drawings — (G) Readily available — G Up to date — G N/A
   - G Maintenance logs — (G) Readily available — G Up to date — G N/A

   Remarks _____

2. **Site-Specific Health and Safety Plan** — G Readily available — (G) Up to date — G N/A
   G Contingency plan/emergency response plan — G Readily available — (G) Up to date — G N/A
   Remarks Part of Plan in O&M Manual, currently being updated

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A
   Remarks OSHA Reg. reviewed 4/05 for site specific applicability. Currently being updated; kept in O&M Manual.

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — (G) N/A
   - G Effluent discharge — G Readily available — G Up to date — (G) N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — (G) N/A
   - G Other permits CONSENT ORDER — (G) Readily available — (G) Up to date — G N/A

   Remarks _____

5. **Gas Generation Records** — G Readily available — G Up to date — (G) N/A
   Remarks _____

6. **Settlement Monument Records** — G Readily available — G Up to date — (G) N/A
   Remarks _____

7. **Groundwater Monitoring Records** — G Readily available — (G) Up to date — G N/A
   Remarks Records kept at Pittsburgh office, not on site.

8. **Leachate Extraction Records** — G Readily available — G Up to date — (G) N/A
   Remarks _____

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — (G) N/A
   - G Water (effluent) — G Readily available — G Up to date — (G) N/A

   Remarks _____

10. **Daily Access/Security Logs** — G Readily available — G Up to date — (G) N/A
    Remarks _____

IV. O&M COSTS

1. **O&M Organization**

G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other_____

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

See attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Yearly increased costs due to flooding.

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map (G) Gates secured G N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map (G) N/A
Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes G No G N/A
Site conditions imply ICs not being fully enforced G Yes G No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date (G) Yes G No G N/A
Reports are verified by the lead agency (USEPA - RPMs) (G) Yes G No G N/A - extension

Specific requirements in deed or decision documents have been met G Yes G No (G) N/A
Violations have been reported G Yes G No (G) N/A
Other problems or suggestions: G Report attached

_____
_____
_____
_____

2. **Adequacy** G *ICs are adequate* G *ICs are inadequate* (G) N/A
Remarks _____
_____
_____

D. General

1. ***Vandalism/trespassing*** G *Location shown on site map* (G) *No vandalism evident*
Remarks _____
_____

2. **Land use changes on site** (G) N/A
Remarks _____
_____

3. **Land use changes off site** (G) N/A
Remarks _____
_____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks Access roads maintained
_____

B. Other Site Conditions

Remarks_____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS (G) Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map (G) Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map (G) Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map (G) Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map (G) Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** (G) Grass (G) Cover properly established (G) No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** (G) N/A
   Remarks_____

7. **Bulges** G Location shown on site map (G) Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** (G) Wet areas/water damage not evident
   G Wet areas G Location shown on site map Areal extent_____
   G Ponding G Location shown on site map Areal extent_____
   G Seeps G Location shown on site map Areal extent_____
   G Soft subgrade G Location shown on site map Areal extent_____
   Remarks_____

9. **Slope Instability** G Slides G Location shown on site map (G) No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches G Applicable (G) N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map (G) N/A or okay
   Remarks_____

2. **Bench Breached** G Location shown on site map (G) N/A or okay
   Remarks_____

3. **Bench Overtopped** G Location shown on site map (G) N/A or okay
   Remarks_____

C. Letdown Channels G Applicable (G) N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map (G) No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** G Location shown on site map (G) No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** G Location shown on site map (G) No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** G Location shown on site map (G) No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ (G) No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type None
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
(G) N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance (G) N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks MW #A-Found inside perimeter, not in waste

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks Gravity-leachate to Dem

5. **Settlement Monuments** G Located G Routinely surveyed (G) N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable (G) N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable (G) N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable (G) N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable G N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable (G) N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   (G) Is routinely submitted on time (G) Is of acceptable quality

2. Monitoring data suggests: N/A
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance (G) N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Secure cell @ Bendfeld was installed — monitored quarterly — USEPA retains regulatory authority over PCBs.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Secure cell appears to be functioning as designed.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that sugges: that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

GROUND WATER ORDER

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

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Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

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Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: TRW MINERVA	**Date of inspection:** 11/10/04, 10/13/04, 4/14/05
Location and Region: MINERVA, OH, Region 5	**EPA ID:** OHD 004 179 339
Agency, office, or company leading the five-year review: OHIO EPA NEDO	**Weather/temperature:** 60s 70's, Partly Cloudy

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- G Institutional controls
- (G) Groundwater pump and treatment
- (G) Surface water collection and treatment
- G Monitored natural attenuation
- (G) Groundwater containment
- G Vertical barrier walls
- G Other O&M PLAN (MONITORING) WELL PERIODICAL SAMPLING

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** STEVE NELSON (Name) SITE OPERATOR (Title) 11/10/04 / 10/13/04 / 4/14/05 (Date)
   Interviewed (G) at site G at office G by phone Phone no. 330 868 4370
   Problems, suggestions; G Report attached Conducts routine maintenance, monitoring well maintenance

2. **O&M staff** NONE (Name) (Title) (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

Mr. Nelson reports to the Independent Project Manager, Paul Jack, Castle Bay, Inc., Pittsburgh Pa 412-826-3277

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3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Canton Air
Contact PAT SHEVICK — Name — Title — Date — 330-484-3388 Phone no.
Problems; suggestions; G Report attached

Agency Village of Minerva Water Dept.
Contact STEVE JACKSON — Name — Title — Date — 330-868-7705 Phone no.
Problems; suggestions; G Report attached

Agency Ohio EPA
Contact PHIL RHODES — Name — Title — Date — 330 963-1136 Phone no.
Problems; suggestions; G Report attached NPDES Permit

Agency USEPA/ORC Div. Region 5
Contact Steve Johnson — Name — Project Manager — Title — 12/6/04 — Date — 312-886-1330 Phone no.
Problems; suggestions; G Report attached

4. **Other interviews** (optional) G Report attached.

Dave Bowland, Ohio EPA/NEDO 330-963-1236
re: Minerva Public Water System

Bill Franks - Stark County Health Dept. - 330-493-7904
Private Well authority + Water related issues

Dave Stroud - Water Quality - Sandy Creek
Ohio EPA/NEDO 330-963-1177

Gladys Beard - USEPA Region 5 Proj Manager 312-886-7253

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III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — (G) Readily available — G Up to date — G N/A
   - G As-built drawings — (G) Readily available — G Up to date — G N/A
   - G Maintenance logs — (G) Readily available — G Up to date — G N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — G Readily available — (G) Up to date — G N/A
   G Contingency plan/emergency response plan — G Readily available — (G) Up to date — G N/A

   Remarks Kept on Site in O&M Manual, Currently being updated

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks OSHA App. Reviewed 4/05 for Site Specific Applicability Currently being updated, Kept on Site in O&M Manual

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — (G) N/A
   - G Effluent discharge ON MOBILE LAP TOP — (G) Readily available — (G) Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — (G) N/A
   - G Other permits CONSENT ORDER — (G) Readily available — (G) Up to date — G N/A

   Remarks

5. **Gas Generation Records** — G Readily available — G Up to date — (G) N/A

   Remarks

6. **Settlement Monument Records** — G Readily available — G Up to date — (G) N/A

   Remarks

7. **Groundwater Monitoring Records** — G Readily available — (G) Up to date — G N/A

   Remarks Records Kept at Pittsburgh LA office, nation Site

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks Same as #7

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks Same as #7

10. **Daily Access/Security Logs** — G Readily available — G Up to date — (G) N/A

    Remarks

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IV. O&M COSTS

1. **O&M Organization**

G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other_____

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

See attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

Illegally elevated Separated Paste due to flooding.

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map (G) Gates secured G N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map (G) N/A
Remarks_____

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C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes G No G N/A
Site conditions imply ICs not being fully enforced — G Yes G No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date MONITORING — (G) Yes G No G N/A
Reports are verified by the lead agency — (G) Yes G No G N/A

Specific requirements in deed or decision documents have been met — G Yes G No (G) N/A
Violations have been reported — G Yes G No (G) N/A
Other problems or suggestions: G Report attached

_____
_____
_____
_____

2. **Adequacy** G ICs are adequate G ICs are inadequate (G) N/A
Remarks _____
_____
_____

D. General

1. **Vandalism/trespassing** G Location shown on site map (G) No vandalism evident
Remarks _____
_____

2. **Land use changes on site** G (N/A)
Remarks _____
_____

3. **Land use changes off site** G (N/A)
Remarks _____
_____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks access roads, speed boundary due to flooding

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B. Other Site Conditions

Remarks_____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
   Remarks_____
   _____

7. **Bulges** G Location shown on site map G Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

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8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks The P+T Buildings has had damage due to 100-50 year flood in area.

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable G N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable G N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

GW

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

GW

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

BW

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable G N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

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IX. GROUNDWATER/SURFACE WATER REMEDIES (G) Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines (G) Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   (G) Good condition (G) All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   (G) Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks replaced as needed for new parts. Adequate supply needed.

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable (G) N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. ***Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances***
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

GW

C. Treatment System (G) Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   (G) Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   (G) Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   (G) Sampling/maintenance log displayed and up to date
   (G) Equipment properly identified
   G Quantity of groundwater treated annually 1.5 Million gpd
   G Quantity of surface water treated annually N/A
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A (G) Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   (G) N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A (G) Good condition G Needs Maintenance
   Remarks gravity-fed pipe

5. **Treatment Building(s)**
   G N/A (G) Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks Some wells need fixed covers/lumps/grout, etc. Wells are currently being repaired.

D. Monitoring Data

1. Monitoring Data
   (G) Is routinely submitted on time (G) Is of acceptable quality

2. Monitoring data suggests:
   (G) Groundwater plume is effectively contained G Contaminant concentrations are ~~declining~~ fluctuating

GW

D. Monitored Natural Attenuation

1. ***Monitoring Wells*** *(natural attenuation remedy)*
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance (G) N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
Remedy is designed to contain & lessen contaminants in the ground water. According to a few wells, (compliance points) the level of contaminants is fluctuating. The is investigating.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
The P&T appears to contain the contaminants. Reasons for fluctuating contaminant levels is under investigation by the.

GW

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

APPENDIX D

PUBLIC NOTICE
TRW MINERVA SITE

A third "Five-Year Review" is being conducted for the TRW Minerva site located at 3860 Union Ave. South, Minerva, Ohio, by the Ohio Environmental Protection Agency (Ohio EPA), Twinsburg, Ohio. The purpose of the Five-Year Review is to evaluate remediation activities conducted at the facility to determine whether conditions are protective of the public health and the environment. This review evaluates environmental conditions between July 2000 and June 2005. The remediation activities have been conducted under two separate Ohio EPA Administrative Orders on Consent (Consent Order). The first Consent Order was dated June 5, 1985 and provided for polychlorinated biphenyls (PCBs) contaminated surface soil and sediment to be placed in an on-site secure cell landfill that is periodically monitored. The second Consent Order dated May 9, 1986, provided for a ground water pumping and treat system for chlorinated solvent contaminated ground water that is also periodically monitored.

Any knowledge regarding current site conditions, problems or related concerns can be communicated to Vicki Deppisch, Ohio EPA, Twinsburg, Ohio at 330-963-1207. The scheduled date of completion of the Five-Year Review is September 21, 2005. At that time, another public notice will be posted advising completion and a summary of the Review.

Published In The Repository Feb. 2, 2005.

OhioEPA
State of Ohio Environmental Protection Agency
Northeast District Office

2110 E. Aurora Road
Twinsburg, Ohio 44087-1969

TELE (330) 425-9171 FAX (330) 487-0769

Bob Taft, Governor
Christopher Jones, Director

November 23, 2004

RE: TRW MINERVA
STARK COUNTY
THIRD "FIVE-YEAR REVIEW"

Ms. Marie Wolf
410 Adeleide
Minerva, OH 44657

Dear Ms. Wolf:

The purpose of this letter is to advise you that the Ohio Environmental Protection Agency (Ohio EPA) is conducting the third "Five-Year Review" for the TRW Minerva Site. The TRW Minerva Site is located at 3860 Union Avenue South, Minerva, Ohio, in Stark County. In the past and reaffirmed in our phone conversation on November 17, 2004, you have maintained significant interest in the TRW Minerva Site as a member of the Minerva community. In the coming months, Ohio EPA will be contacting you to get your views about current site conditions, problems, or related concerns. As you know, additional investigative work is currently underway at the Site. An additional source has been identified involving chlorinated solvents and PCBs. Future plans include defining the rate and extent and remediation of this contamination.

Ohio EPA will be the lead agency conducting the review for the U.S. Environmental Protection Agency (U.S. EPA). The Five-Year Review will evaluate the performance of the PCB secure cell landfill and the ground water pump and treatment system, to determine if these remedies are protective of human health and the environment. As with the previous Five-Year Reviews, Ohio EPA will provide a copy to the Minerva library (TRW Minerva repository), when completed. The final draft copy of the Five-Year Review is due to U.S. EPA by August 21, 2005.

Please feel free to call me at (330) 963-1207, if you have any questions.

Sincerely,

Vicki Deppisch
Project Coordinator
Division of Emergency and Remedial Response

VD/kss

cc: Paul Jack, Castle Bay, Inc.
Gladys Beard, U.S. EPA, Region 5

ec: Mike Eberle, Ohio EPA, DERR, NEDO

TRW MINERVA

THIRD FIVE-YEAR REVIEW

INTERVIEW

Community Representative Interview

Marie Wolf, Community Advisory Spokesperson
Date: May 11, 2005
Place of interview: Minerva, Ohio

Ms. Wolf was updated on current site conditions. This includes Northrup Grumman's ongoing source investigation.

(1) Ms. Wolf's overall impression of the project (with emphasis between the last (second) Five-Year Review completed in 2000 and 2005), was that the remedy (P&T) seems to be effective at protecting Minerva's municipal water supply wells.

(2) She did not notice any effects on the surrounding community from site operations.

(3) She is concerned about the safety of the municipal water supply if the P&T system is turned off permanently.

(4) She is not aware of any events, incidents, or activities at the site such as vandalism, trespassing or emergency responses from local authorities.

(5) Ms. Wolf felt she was well informed abut the site's activities and progress by Ohio EPA and Mr. Paul Jack.

(6) She indicated current site activities appear to be going smoothly and therefore she did not have any comments, suggestions, or recommendations regarding the site's management or operation.

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
MARIE WOLF	COMMUNITY ADVISORY BOARD SPOKESPERSON	CONCERNED CITIZENS	5/11/05
PAUL JACK	PROJECT MANAGER TRW MINERVA	CABLE BRIDGE FOR TOWNSHIP GUARDIAN	10/13/05
↳ Comments reflected in separate information on the 'Checklists'			

APPENDIX E

Application No. OH0084018

Issue Date: October 30, 2003

Effective Date: December 1, 2003

Expiration Date: November 30, 2008

Ohio Environmental Protection Agency
Authorization to Discharge Under the
National Pollutant Discharge Elimination System

In compliance with the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. seq., hereinafter referred to as the "Act"), and the Ohio Water Pollution Control Act (Ohio Revised Code Section 6111),

Northrop Grumman Space & Mission System Corporation
Minerva Ground Water Remediation Facility

is authorized by the Ohio Environmental Protection Agency, hereinafter referred to as "Ohio EPA," to discharge from the Minerva Ground Water Remediation Facility located at 4200 Union Avenue, Minerva, Ohio, Stark County and discharging to Sandy Creek in accordance with the conditions specified in Parts I, II, and III of this permit.

This permit is conditioned upon payment of applicable fees as required by Section 3745.11 of the Ohio Revised Code.

This permit and the authorization to discharge shall expire at midnight on the expiration date shown above. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information and forms as are required by the Ohio EPA no later than 180 days prior to the above date of expiration.

Christopher Jones
Director

Total pages: 15

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of the permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 3ID00060001. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Final Outfall - 001 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day			Measuring	Sampling	Monitoring
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Frequency	Type	Months
00400 - pH - S.U.	9.0	6.5	-		-	-	-	1/Month	Grab	All
34311 - Chloroethane - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
34475 - Tetrachloroethylene - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
34496 - 1,1-Dichloroethane - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
34506 - 1,1,1-Trichloroethane - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
34531 - 1,2 Dichloroethane - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
34546 - 1,2-trans-Dichloroethylene - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
39175 - Vinyl Chloride - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
39180 - Trichloroethylene - ug/l	10	-	-	5	0.065	-	0.033	1/Month	Grab	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	1/Month	24hr Total	All
77093 - C-1,2-Dichloroethene - ug/l	30	-	-	20	0.196	-	0.131	1/Month	Grab	All
82092 - Total Volatile Organics - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All

Notes for Station Number 3ID00060001:

* Effluent loadings based on average design flow of 1.728 MGD.
- Sampling shall be performed when discharging. If NO DISCHARGE OCCURS DURING THE ENTIRE MONTH, report "AL" in the first column of the first day of the month on the 4500 Form (Monthly Operating Report). A signature is still required.
- Total Volatile Organics is the summation of all volatile organic compounds as listed in 40 cfr 136 test method 601

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 3ID00060701. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Internal Monitoring Station - 701 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
34311 - Chloroethane - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
34475 - Tetrachloroethylene - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
34496 - 1,1-Dichloroethane - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
34506 - 1,1,1-Trichloroethane - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
34531 - 1,2-Dichloroethane - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
34546 - 1,2-trans-Dichloroethylene - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
39175 - Vinyl Chloride - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
39180 - Trichloroethylene - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
77093 - C-1,2-Dichloroethene - ug/l	-	-	-	-	-	-	-	1/Month	Grab	All
82092 - Total Volatile Organics - ug/l	-	-	-	-	-	-	-	1/Month	Continuous	All

Notes for station 3ID00060701:

- Total Volatile Organics is the summation of all volatile organic compounds as listed in 40 cfr 136 test method 601

Part II, OTHER REQUIREMENTS

A. Description of the location of the required sampling stations are as follows:

Sampling Station	Description of Location
3ID00060001	At the sample port of the effluent of the air stripper prior to enetering the unnamed tributary of Sandy Creek (Lat: 40 44 ' 29 "; Long: 81 05' 30")
3ID00060701	At the sample port of the influent of the air stripper containing contaminated groundwater from eight recovery wells

B. This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved.

1. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
2. Controls any pollutant not limited in the permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

C. Permit limitations may be revised in order to meet water quality standards after a stream use determination and waste load allocation are completed and approved. This permit may be modified, or alternatively, revoked and reissued, to comply with any applicable water quality effluent limitations.

D. Grab samples shall be collected at such times and locations, and in such fashion, as to be representative of the facility's performance.

PART III - GENERAL CONDITIONS

1. DEFINITIONS

"Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

"Average weekly" discharge limitation means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week. Each of the following 7-day periods is defined as a calendar week: Week 1 is Days 1 - 7 of the month; Week 2 is Days 8 - 14; Week 3 is Days 15 - 21; and Week 4 is Days 22 - 28. If the "daily discharge" on days 29, 30 or 31 exceeds the "average weekly" discharge limitation, Ohio EPA may elect to evaluate the last 7 days of the month as Week 4 instead of Days 22 - 28. Compliance with fecal coliform bacteria or E coli bacteria limitations shall be determined using the geometric mean.

"Average monthly" discharge limitation means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month. Compliance with fecal coliform bacteria or E coli bacteria limitations shall be determined using the geometric mean.

"85 percent removal" means the arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period.

"Absolute Limitations" Compliance with limitations having descriptions of "shall not be less than," "nor greater than," "shall not exceed," "minimum," or "maximum" shall be determined from any single value for effluent samples and/or measurements collected.

"Net concentration" shall mean the difference between the concentration of a given substance in a sample taken of the discharge and the concentration of the same substances in a sample taken at the intake which supplies water to the given process. For the purpose of this definition, samples that are taken to determine the net concentration shall always be 24-hour composite samples made up of at least six increments taken at regular intervals throughout the plant day.

"Net Load" shall mean the difference between the load of a given substance as calculated from a sample taken of the discharge and the load of the same substance in a sample taken at the intake which supplies water to given process. For purposes of this definition, samples that are taken to determine the net loading shall always be 24-hour composite samples made up of at least six increments taken at regular intervals throughout the plant day.

"MGD" means million gallons per day.

"mg/l" means milligrams per liter.

"ug/l" means micrograms per liter.

"ng/l" means nanograms per liter.

"S.U." means standard pH unit.

"kg/day" means kilograms per day.

"Reporting Code" is a five digit number used by the Ohio EPA in processing reported data. The reporting code does not imply the type of analysis used nor the sampling techniques employed.

"Quarterly (1/Quarter) sampling frequency" means the sampling shall be done in the months of March, June, August, and December, unless specifically identified otherwise in the Effluent Limitations and Monitoring Requirements table.

"Yearly (1 Year) sampling frequency" means the sampling shall be done in the month of September, unless specifically identified otherwise in the effluent limitations and monitoring requirements table.

"Semi-annual (2/Year) sampling frequency" means the sampling shall be done during the months of June and December, unless specifically identified otherwise.

"Winter" shall be considered to be the period from November 1 through April 30.

"Bypass" means the intentional diversion of waste streams from any portion of the treatment facility.

"Summer" shall be considered to be the period from May 1 through October 31.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

2. GENERAL EFFLUENT LIMITATIONS

The effluent shall, at all times, be free of substances:

A. In amounts that will settle to form putrescent, or otherwise objectionable, sludge deposits; or that will adversely affect aquatic life or water fowl;

B. Of an oily, greasy, or surface-active nature, and of other floating debris, in amounts that will form noticeable accumulations of scum, foam or sheen;

C. In amounts that will alter the natural color or odor of the receiving water to such degree as to create a nuisance;

D. In amounts that either singly or in combination with other substances are toxic to human, animal, or aquatic life;

E. In amounts that are conducive to the growth of aquatic weeds or algae to the extent that such growths become inimical to more desirable forms of aquatic life, or create conditions that are unsightly, or constitute a nuisance in any other fashion;

F. In amounts that will impair designated instream or downstream water uses.

3. FACILITY OPERATION AND QUALITY CONTROL

All wastewater treatment works shall be operated in a manner consistent with the following:

A. At all times, the permittee shall maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee necessary to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with conditions of the permit.

B. The permittee shall effectively monitor the operation and efficiency of treatment and control facilities and the quantity and quality of the treated discharge.

C. Maintenance of wastewater treatment works that results in degradation of effluent quality shall be scheduled during non-critical water quality periods and shall be carried out in a manner approved by Ohio EPA as specified in the Paragraph in the PART III entitled, "UNAUTHORIZED DISCHARGES".

4. REPORTING

A. Monitoring data required by this permit may be submitted in hardcopy format on the Ohio EPA 4500 report form pre-printed by Ohio EPA or an approved facsimile. Ohio EPA 4500 report forms for each individual sampling station are to be received no later than the 15th day of the month following the month-of-interest. The original report form must be signed and mailed to:

Ohio Environmental Protection Agency
Lazarus Government Center
Division of Surface Water
Enforcement Section ES/MOR
P.O. Box 1049
Columbus, Ohio 43216-1049

Monitoring data may also be submitted electronically using Ohio EPA developed SWIMware software. Data must be transmitted to Ohio EPA via electronic mail or the bulletin board system by the 20th day of the month following the month-of-interest. A Surface Water Information Management System (SWIMS) Memorandum of Agreement (MOA) must be signed by the responsible official and submitted to Ohio EPA to receive an authorized Personal Identification Number (PIN) prior to sending data electronically. A hardcopy of the Ohio EPA 4500 form must be generated via SWIMware, signed and maintained onsite for records retention purposes.

B. If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified below, the results of such monitoring shall be included in the calculation and reporting of the values required in the reports specified above.

C. Analyses of pollutants not required by this permit, except as noted in the preceding paragraph, shall not be reported on Ohio EPA report form (4500) but records shall be retained as specified in the paragraph entitled "RECORDS RETENTION".

5. SAMPLING AND ANALYTICAL METHOD

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored flow. Test procedures for the analysis of pollutants shall conform to regulation 40 CFR 136, "Test Procedures For The Analysis of Pollutants" unless other test procedures have been specified in this permit. The permittee shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals to insure accuracy of measurements.

6. RECORDING OF RESULTS

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

A. The exact place and date of sampling; (time of sampling not required on EPA 4500)

B. The person(s) who performed the sampling or measurements;

C. The date the analyses were performed on those samples;

D. The person(s) who performed the analyses;

E. The analytical techniques or methods used; and

F. The results of all analyses and measurements.

7. RECORDS RETENTION

The permittee shall retain all of the following records for the wastewater treatment works for a minimum of three years, including:

A. All sampling and analytical records (including internal sampling data not reported);

B. All original recordings for any continuous monitoring instrumentation;

C. All instrumentation, calibration and maintenance records;

D. All plant operation and maintenance records;

E. All reports required by this permit; and

F. Records of all data used to complete the application for this permit for a period of at least three years from the date of the sample, measurement, report, or application.

These periods will be extended during the course of any unresolved litigation, or when requested by the Regional Administrator or the Ohio EPA. The three year period for retention of records shall start from the date of sample, measurement, report, or application.

8. AVAILABILITY OF REPORTS

Except for data determined by the Ohio EPA to be entitled to confidential status, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the appropriate district offices of the Ohio EPA. Both the Clean Water Act and Section 6111.05 Ohio Revised Code state that effluent data and receiving water quality data shall not be considered confidential.

9. DUTY TO PROVIDE INFORMATION

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking, and reissuing, or terminating the permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

10. RIGHT OF ENTRY

The permittee shall allow the Director or an authorized representative upon presentation of credentials and other documents as may be required by law to:

A. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit.

B. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit.

C. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit.

D. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

11. UNAUTHORIZED DISCHARGES

A. Bypassing or diverting of wastewater from the treatment works is prohibited unless:

1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of downtime. This condition is not satisfied if adequate back up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

3. The permittee submitted notices as required under paragraph D. of this section,

B. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

C. The Director may approve an unanticipated bypass after considering its adverse effects, if the Director determines that it has met the three conditions listed in paragraph 11.A. of this section.

D. The permittee shall submit notice of an unanticipated bypass as required in section 12. A.

E. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded if that bypass is for essential maintenance to assure efficient operation.

12. NONCOMPLIANCE NOTIFICATION

A. The permittee shall by telephone report any of the following within twenty-four (24) hours of discovery at (toll free) 1-800-282-9378:

1. Any noncompliance which may endanger health or the environment;

2. Any unanticipated bypass which exceeds any effluent limitation in the permit; or

3. Any upset which exceeds any effluent limitation in the permit.

4. Any violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit.

B. For the telephone reports required by Part 12.A., the following information must be included:

1. The times at which the discharge occurred, and was discovered;

2. The approximate amount and the characteristics of the discharge;

3. The stream(s) affected by the discharge;

4. The circumstances which created the discharge;

5. The names and telephone numbers of the persons who have knowledge of these circumstances;

6. What remedial steps are being taken; and

7. The names and telephone numbers of the persons responsible for such remedial steps.

C. These telephone reports shall be confirmed in writing within five days of the discovery of the discharge and/or noncompliance and submitted to the appropriate Ohio EPA district office. The report shall include the following:

1. The limitation(s) which has been exceeded;

2. The extent of the exceedance(s);

3. The cause of the exceedance(s);

4. The period of the exceedance(s) including exact dates and times;

5. If uncorrected, the anticipated time the exceedance(s) is expected to continue, and

6. Steps being taken to reduce, eliminate, and/or prevent occurrence of the exceedance(s).

D. Compliance Schedule Events:

If the permittee is unable to meet any date for achieving an event, as specified in the schedule of compliance, the permittee shall submit a written report to the appropriate district office of the Ohio EPA within 14 days of becoming aware of such situation. The report shall include the following:

1. The compliance event which has been or will be violated;

2. The cause of the violation;

3. The remedial action being taken;

4. The probable date by which compliance will occur; and

5. The probability of complying with subsequent and final events as scheduled.

E. The permittee shall report all instances of noncompliance not reported under paragraphs A, B, or C of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraphs B and C of this section.

F. Where the permittee becomes aware that it failed to submit any relevant application or submitted incorrect information in a permit application or in any report to the director, it shall promptly submit such facts or information.

13. RESERVED

14. DUTY TO MITIGATE

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

15. AUTHORIZED DISCHARGES

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than, or at a level in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit. Such violations may result in the imposition of civil and or criminal penalties as provided for in Section 309 of the Act and Ohio Revised Code Sections 6111.09 and 6111.99.

16. DISCHARGE CHANGES

The following changes must be reported to the appropriate Ohio EPA district office as soon as practicable:

A. For all treatment works, any significant change in character of the discharge which the permittee knows or has reason to believe has occurred or will occur which would constitute cause for modification or revocation and reissuance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. Notification of permit changes or anticipated noncompliance does not stay any permit condition.

B. For publicly owned treatment works:

1. Any proposed plant modification, addition, and or expansion that will change the capacity or efficiency of the plant;

2. The addition of any new significant industrial discharge; and

3. Changes in the quantity or quality of the wastes from existing tributary industrial discharges which will result in significant new or increased discharges of pollutants.

C. For non-publicly owned treatment works, any proposed facility expansions, production increases, or process modifications, which will result in new, different, or increased discharges of pollutants.

Following this notice, modifications to the permit may be made to reflect any necessary changes in permit conditions, including any necessary effluent limitations for any pollutants not identified and limited herein. A determination will also be made as to whether a National Environmental Policy Act (NEPA) review will be required. Sections 6111.44 and 6111.45, Ohio Revised Code, require that plans for treatment works or improvements to such works be approved by the Director of the Ohio EPA prior to initiation of construction.

D. In addition to the reporting requirements under 40 CFR 122.41(l) and per 40 CFR 122.42(a), all existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

1. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis of any toxic pollutant which is not limited in the permit. If that discharge will exceed the highest of the "notification levels" specified in 40 CFR Sections 122.42(a)(1)(i) through 122.42(a)(1)(iv).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" specified in 122.42(a)(2)(i) through 122.42(a)(2)(iv).

17. TOXIC POLLUTANTS

The permittee shall comply with effluent standards or prohibitions established under Section 307 (a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement. Following establishment of such standards or prohibitions, the Director shall modify this permit and so notify the permittee.

18. PERMIT MODIFICATION OR REVOCATION

A. After notice and opportunity for a hearing, this permit may be modified or revoked, by the Ohio EPA, in whole or in part during its term for cause including, but not limited to, the following:

1. Violation of any terms or conditions of this permit;

2. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

3. Change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

B. Pursuant to rule 3745-33-04, Ohio Administrative Code, the permittee may at any time apply to the Ohio EPA for modification of any part of this permit. The filing of a request by the permittee for a permit modification or revocation does not stay any permit condition. The application for modification should be received by the appropriate Ohio EPA district office at least ninety days before the date on which it is desired that the modification become effective. The application shall be made only on forms approved by the Ohio EPA.

19. TRANSFER OF OWNERSHIP OR CONTROL

This permit may be transferred or assigned and a new owner or successor can be authorized to discharge from this facility, provided the following requirements are met:

A. The permittee shall notify the succeeding owner or successor of the existence of this permit by a letter, a copy of which shall be forwarded to the appropriate Ohio EPA district office. The copy of that letter will serve as the permittee's notice to the Director of the proposed transfer. The copy of that letter shall be received by the appropriate Ohio EPA district office sixty (60) days prior to the proposed date of transfer;

B. A written agreement containing a specific date for transfer of permit responsibility and coverage between the current and new permittee (including acknowledgement that the existing permittee is liable for violations up to that date, and that the new permittee is liable for violations from that date on) shall be submitted to the appropriate Ohio EPA district office within sixty days after receipt by the district office of the copy of the letter from the permittee to the succeeding owner;

At anytime during the sixty (60) day period between notification of the proposed transfer and the effective date of the transfer, the Director may prevent the transfer if he concludes that such transfer will jeopardize compliance with the terms and conditions of the permit. If the Director does not prevent transfer, he will modify the permit to reflect the new owner.

20. OIL AND HAZARDOUS SUBSTANCE LIABILITY

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

21. SOLIDS DISPOSAL

Collected screenings, slurries, sludges, and other solids shall be disposed of in such a manner as to prevent entry of those wastes into waters of the state. For publicly owned treatment works, these shall be disposed of in accordance with the approved Ohio EPA Sludge Management Plan.

22. CONSTRUCTION AFFECTING NAVIGABLE WATERS

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

23. CIVIL AND CRIMINAL LIABILITY

Except as exempted in the permit conditions on UNAUTHORIZED DISCHARGES or UPSETS, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

24. STATE LAWS AND REGULATIONS

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Clean Water Act.

25. PROPERTY RIGHTS

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

26. UPSET

The provisions of 40 CFR Section 122.41(n), relating to "Upset," are specifically incorporated herein by reference in their entirety. For definition of "upset," see Part III, Paragraph 1, DEFINITIONS.

27. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

28. SIGNATORY REQUIREMENTS

All applications submitted to the Director shall be signed and certified in accordance with the requirements of 40 CFR 122.22.

All reports submitted to the Director shall be signed and certified in accordance with the requirements of 40 CFR Section 122.22.

29. OTHER INFORMATION

A. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

B. ORC 6111.99 provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000 per violation.

C. ORC 6111.99 states that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $25,000 per violation.

D. ORC 6111.99 provides that any person who violates Sections 6111.04, 6111.042, 6111.05, or division (A) of Section 6111.07 of the Revised Code shall be fined not more than $25,000 or imprisoned not more than one year, or both.

30. NEED TO HALT OR REDUCE ACTIVITY

40 CFR 122.41(c) states that it shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with conditions of this permit.

31. APPLICABLE FEDERAL RULES

All references to 40 CFR in this permit mean the version of 40 CFR which is effective as of the effective date of this permit.

32. AVAILABILITY OF PUBLIC SEWERS

Not withstanding the issuance or non-issuance of an NPDES permit to a semi-public disposal system, whenever the sewage system of a publicly owned treatment works becomes available and accessible, the permittee operating any semi-public disposal system shall abandon the semi-public disposal system and connect it into the publicly owned treatment works.

For Time period covering 9/2/00 thru 11/1/04

Violations Report For: Minerva Groundwater Remediation Facility

OEPA No. 3ID00060*CD

Month: Aug

Year: 2001

Date	Violation Type	Description
8/1/2001	Numeric Violation	Station 001, Parameter C-1,2-Dichloroethene ,Reported Value : 23 Limit : 20 (30 day concentration maximum)
8/20/2001	Numeric Violation	Station 001, Parameter C-1,2-Dichloroethene ,Reported Value : 36 Limit : 30 (Daily concentration max)

Total Numeric Violations for Month: 2

Total Non-Numeric Violations for Month: 0

Total Frecuency Violations for Month: 0

Total Violations for Month: 2

Violations Report For: Minerva Groundwater Remediation Facility

OEPA No. 3ID00060*CD

Month: Mar

Year: 2002

Date	Violation Type	Description
3/31/2002	Frequency Violation	3ID00060*CD 001 Total Volatile Organics (82092) Expected Number of results : 1, Reported results : 0

Total Numeric Violations for Month: 0

Total Non-Numeric Violations for Month: 0

Total Frequency Violations for Month: 1

Total Violations for Month: 1

Violations Report For: Minerva Groundwater Remediation Facility

OEPA No. 3ID00060*CD

Month: Apr

Year: 2002

Date	Violation Type	Description
4/30/2002	Frequency Violation	3ID00060*CD 001 pH (00400) Expected Number of results : 1, Reported results : 0

Total Numeric Violations for Month: 0

Total Non-Numeric Violations for Month: 0

Total Frequency Violations for Month: 1

Total Violations for Month: 1

Violations Report For: Minerva Groundwater Remediation Facility

OEPA No. 3ID00060*CD

Month: Jun
Year: 2002

Date	Violation Type	Description
6/1/2002	Numeric Violation	Station 001, Parameter Trichloroethylene ,Reported Value : 11 Limit : 5 (30 day concentration maximum)
6/28/2002	Numeric Violation	Station 001, Parameter Trichloroethylene ,Reported Value : 11 Limit : 10 (Daily concentration max)

Total Numeric Violations for Month: 2

Total Non-Numeric Violations for Month: 0

Total Frequency Violations for Month: 0

Total Violations for Month: 2

Violations Report For: Minerva Groundwater Remediation Facility

OEPA No. 3ID00060*CD

Month: Mar

Year: 2003

Date	Violation Type	Description
3/31/2003	Frequency Violation	001 Freq 2003-03-31 82092 Total Volatile Organic1/Month 1 0

Total Numeric Violations for Month: 0

Total Non-Numeric Violations for Month: 0

Total Frequency Violations for Month: 1

Total Violations for Month: 1

Violations Report For: Minerva Groundwater Remediation Facility

OEPA No. 3ID00060*DD

Month: Jan
Year: 2004

Date	Violation Type	Description
1/31/2004	Frequency Violation	001 Freq 2004-01-31 82092 Total Volatile Organic1/Month 1 0

Total Numeric Violations for Month: 0

Total Non-Numeric Violations for Month: 0

Total Frequency Violations for Month: 1

Total Violations for Month: 1

APPENDIX F

TRW Minerva

Ground Water Monitoring and Recovery Well System

2005

Prepared by CDM (Camp, Dresser and McKee)